ORİJİNAL ARAŞTIRMA   ORIGINAL RESEARCH

CAN NECK CIRCUMFERENCE BE USED AS A NEW AN-THROPOMETRIC MEASUREMENT TO DETECT META-BOLIC SYNDROME?

METABOLİK SENDROMUN TESPİTİ İÇİN BOYUN ÇEVRESİ YENİ BİR ANTROPOMETRİK ÖLÇÜM OLARAK KULLANILABİLİR Mİ?

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ABSTRACT: Neck circumference (NC) which can be used as an obesity index for the upper body part is a simple screening method. There are contemporary articles showing that high NC can be positively correlated with metabolic syndrome components and can be related to hyperinsulinemia/ insulin resistance.

Thirty- six patients with metabolic syndrome and 52 normal subjects were evaluated. Biochemical parameters, HbA1c and fructosamine were evaluated and anthropometric measurements were done. NC was measured at the level of hyoid bone by same physician in all patients.

The mean NC of metabolic syndrome patients was measured as 36.5±2.4 while mean NC of normal subjects was obtained as 34.5±2.5 cm; the difference between two groups was statistically significant (p<0.01). Among female patients, there was a statistically significant difference between NC of patients with high body mass index, waist hip ratio and waist circumference (for all three parameters p value being < 0.01). There was also significant statistical difference between NC of male patients with high body mass index, waist hip ratio, waist circumference and body fat index (p values 0.01, <0.01, <0.05, and 0.02)

NC is a promising and simple anthropometric measurement technique for early detection of patients with risk factors. There is need for determination of a certain level and standardization of the NC measurement.

Key words: Neck circumference, metabolic syndrome

ÖZET: Boyun çevresi (BÇ) vücudun üst kısmında obezitenin belirlenmesinde kullanılabilecek basit bir tarama yöntemidir. Artmış bir boyun çevresi ölçümünün metabolik sendrom komponentleriyle pozitif korele olduğu ve hiperinsülinemi ve/veya insülin direnci ile de bağlantılı olabileceğini belirten güncel yayınlar vardır.

Metabolik sendrom kriterlerini taşıyan 36 Metabolik sendromlu hasta ve 52 normal kişi çalışmada değerlendirildi. Biyokimyasal değerler, HbA1c ve fruktozamin parametreleri çalışıldı. Ayrıca antropometrik ölçümleri yapıldı. Boyun çevresi ölçümleri hyoid kemik düzeyinde tüm hastalarda aynı hekim tarafından uygulandı.

Metabolik sendromu olan hastaların boyun çevresi ortalaması 36.5±2.4 cm ölçülürken, kontrol grubunun 34.5±2.5 cm olarak belirlendi. İstatistiksel olarak fark anlamlıydı (p<0.01).

Kadınlar açısından; metabolik sendromu olanlarda beden kitlesi indeksi, bel kalça oranı ve bel çevresi fazla olanlarda boyun çevresi yönünden de istatistiksel olarak anlamlı bir fark bulundu (Her üç parametre için p< 0.01 olmak üzere). Erkeklerde de; yüksek beden kitlesi indeksi, bel kalça oranı, bel çevresi ve vücut yağ yüzdesi olanlarda boyun çevresi yönünden de anlamlı bir fark görüldü (sırasıyla p değerleri 0.01, <0.01, <0.05, ve 0.02).

Boyun çevresi ölçümü risk faktörü olan hastaların erken belirlenmesinde umut verici ve basit bir antropometrik ölçümdür. Bununla birlikte, boyun çevresi ölçümünün yapılacağı düzey ve ölçüm tekniğinin standardizasyonuna htiyaç vardır.

Anahtar Kelimeler: Boyun çevresi, metabolik sendrom.

Life style and nutrition changes caused a dramatic increase at incidence of obesity, diabetes and metabolic syndrome (1). Currently metabolic syndrome is observed quite common and is considered to be a very important health problem. With life quality standards increasing, the importance will also continue to increase.

There are several diagnostic criteria that are being used for the diagnosis of metabolic syndrome (2). Currently, among the components used for detecting the metabolic syndrome are waist circumference, fasting blood glucose level, arterial blood pressure, triglyceride level and HDL cholesterol levels (3). In general, these components are related to visceral obesity, insulin resistance and increased cardiovascular risk (4). Metabolic syndrome diagnostic criteria vary between different scientific groups. For the definition of metabolic syndrome, American and European guidelines take abdominal obesity as a criterion instead of obesity (5).

The prevalence of metabolic syndrome varies from 10% to 30%, depending on the differences at diagnostic criteria. One of these criteria; visceral obesity, is an obligation for the diagnosis of metabolic syndrome and basically identified by measuring the waist circumference (1).

Although waist circumference (abdominal obesity) which is a clinical sign of visceral obesity is not an absolute marker of insulin resistance. It is yet an anthropometric variable that is thought to be related to presence and degree of insulin resistance (3).

Since 1950's, researches stated that body morphology or fat tissue distribution type, with relation to obesity, cause some health risks (3). Determination of body fat distribution is important to foresee the related problems and define risk factors. Various anthropometric measurements are helpful at determining of risk factors. Height, weight, abdominal circumference, abdomen and hip circumference, waist - to - hip ratio and body mass index calculation are among these measurements. However, neck circumference (NC) measurement is a simple technique that helps to reach the result without the need for complicated methods (6).

NC, which can be used as an obesity index for the upper body part, is defined as a simple screening method especially used for determining overweight and obese patients and in general, patients with metabolic syndrome (3,6). As an anthropometric measurement index, there are articles showing that significantly high NC can be positively correlated with metabolic syndrome variables and can be related to hyperinsulinemia/ insulin resistance (7).

In this study, we tried to evaluate the relationship between metabolic syndrome and NC which is an anthropometric measurement that can be easily obtained.

METHODS

We included 36 patients diagnosed to have metabolic syndrome who had applied to internal medicine outpatient clinic at our hospital. The patients who had any three of the five criterion that was defined for the diagnosis of metabolic syndrome according to The National Cholesterol Education Program's Adult Treatment Panel III Guidelines (NCEP-ATP III) were diagnosed to have metabolic syndrome (8). We also included 52 normal subjects in this study that did not have metabolic syndrome.

Patients who had any known chronic disease or a history of medication for any chronic disease, smokers and patients with active infections were excluded from the study. Fasting blood glucose levels, urea, creatinine, total cholesterol, triglyceride (TG), LDL, HDL, uric acid, HbA1c, fructosamine parameters were measured with Olympus AV-2700 device in biochemistry laboratory.

NC measurement was made at the level of hyoid bone by the same physician in all patients. For females, NC measurements below 34 cm. were accepted as normal. On the other hand, measurements equal to 34 cm and over were accepted to be high. For male subjects, measurements below 37 cm were accepted to be normal and measurements equal to 37 cm and over were accepted as high.

Statistical Methods

Statistical analysis was performed by using Statistical Package for Social Sciences (SPSS Inc.) 11.5. Descriptive statistics (mean, standard deviation) were measured by chi square, Student's T, One-way ANOVA, Pearson's correlation tests.

RESULTS

Among 88 subjects who were included in this study, 36 patients (40.9%) had metabolic syndrome, mean-

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while 52 (59.1%) did not have metabolic syndrome.

In Table -1 the age, anthropometric measurements and uric acid values of subjects are compared.

significant difference between NC of patients with high BMI, WHR, and waist circumference and normal subjects (for all three parameters p value being

Table-1: Comparison of subjects' age, some anthropometric measurements and uric acid values			
	NORMAL	METABOLIC SYNDROME	P VALUE
Age (years)	50.9 ± 6.9	55.2 ± 5.1	0.02*
BMI (kg/m2)	28.9 ± 0.8	34.8 ± 2.6	<0.01*
BFI (%)	32.3 ± 3.0	40.9 ± 4.2	<0.01*
WHR	0.91 ± 0.1	0.97 ± 0.1	<0.01*
Waist circumference (cm)	89.2 ± 10.1	111.0 ± 6.0	<0.01*
Uric acid	4.1 ± 1.2	4.9 ± 1.4	<0.01*
Gender			
Female (n, %)	34 (54.8)	28(45.2)	<0.01*
Male (n, %)	18 (69.2)	8 (30.8)	

BMI: Body mass index, BFI: Body fat index, WHR: Waist - to - hip ratio,
*: statistically significant

There was a significant statistical difference between patients with metabolic syndrome and normal subjects when NC is used besides classical anthropometric measurements. The mean NC of metabolic syndrome patients was measured as 36.5 ± 2.4 cm. while mean NC of normal subjects was obtained as 34.5 ± 2.5; the difference between two groups was statistically significant (p<0.01) (Figure-1).

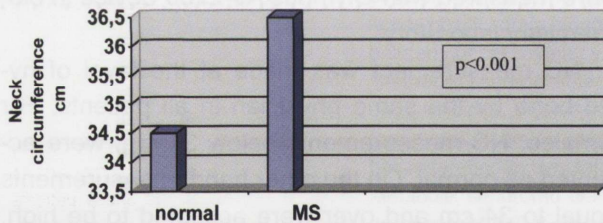Among female patients, there was a statistically

< 0.01) (Figure-2).

Similarly, there was a significant statistical difference between NC of male subjects who had high BMI, WHR, waist circumference, and BFI and of normal subjects (respectively, p values 0.01, <0.01, <0.05, and 0.02) (Figure-3).

Figure-1: Comparison of NC of patients with the Metabolic Syndrome and without.*: statistically significant
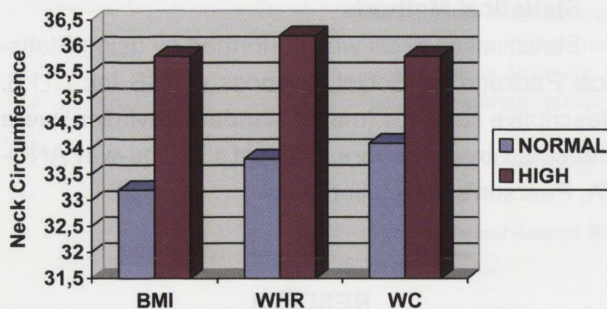
Figure-2: Relation of neck circumference with various anthropometric measurements in female subjects
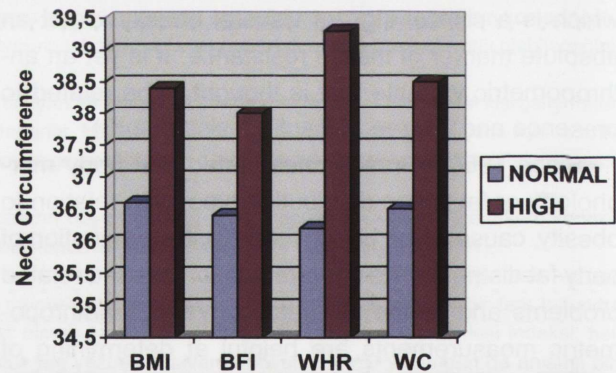

Figure-3: Relation of neck circumference with various anthropometric measurements in male patients

According to correlation tests, a medium correlation between NC and uric acid levels (r=0.47; p<0.01) was identified.

DISCUSSION

In this study, we obtained a significant relation with NC measurement and metabolic syndrome criteria.

Ben-Noun, an investigator who performed com-

prehensive research on NC measurement states that there is a significant relation between metabolic syndrome criteria and neck circumference, According to Ben-Noun, as NC increase, the components of metabolic syndrome and the risk for coronary heart disease are also increased. Moreover, he also states that NC is positively correlated with hypertension, which is again a component of metabolic syndrome (3, 7).

Furthermore, Ben-Noun also stated that NC, a very simple and time saving measurement technique can be used to determine overweight and obese people, which are important cardiovascular risk factors. According to Ben-Noun, males with NC < 37 cm and females with NC < 34 cm cannot be considered to be overweight; nevertheless, NC > or = 37 cm for males and NC > or = 34 cm for females, additional evaluations may be needed to determine overweight or obesity (9).

In our study, mean NC was measured to be 36.5 ± 2.4 cm for patients with metabolic syndrome and it was 34.5 ± 2.5 cm for normal subjects and a statistically significant difference was found between two groups.

Based on evaluation of different studies, high NC measurement in metabolic syndrome patients is sig-nificant. However, the measurement of NC is made at different levels in studies. Laakso performed the measurement horizontally above cricothyroid cartilage level (10). Meanwhile Ben-Noun measured NC at mid-neck height, between mid-cervical spine and mid-anterior neck (3). In another study performed by Dixon and O'Brien, NC was measured above the upper rim of the thyroid cartilage. Moreover the investigators noted that posterior cervical fat pad, if present, should be included with this measurement method (11).

In our study, we performed measurements at the level of hyoid bone. Meanwhile, measurements being taken by the same physician is one of the strong aspects of our study.

Dixon and O'Brien stated that patients with NC below 39 cm, between 39-42 cm, and above 42 cm, had low, medium and high metabolic syndrome risk, respectively (11).

In summary, there is a definete association with metabolic syndrome and NC. NC is a promising and simple anthropometric measurement technique for early detection of patients with risk factors. However, standardization of NC measurement by performing more comprehensive studies is needed.

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