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Relationship between Syntax I - Syntax II and Spielberger State-Trait Anxiety Inventory in stable angina pectoris patients

Kararlı anjina pectoris hastalarında Syntax I - Syntax II ve Spielberger Durumluk-Sürekli Kaygı Ölçeği arasındaki ilişki

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Abstract

Aim: State-trait anxiety inventory (STAI) is a parameter used to measure anxiety levels. SYNTAX score is an anatomically based scoring system used to determine the complexity of coronary artery disease (CAD). We investigated the relationship between SYNTAX-I, SYNTAX-II scores, and STAI.

Methods: A questionnaire-based cross-sectional study was conducted on 150 consecutive patients (54 female and 96 male) who presented to our hospital with the diagnosis of stable angina pectoris and underwent elective coronary angiography (CAG). Patients answered the STAI questionnaire at least 1 hour prior to elective CAG. Assessment of the cineangiographic images was performed by two experienced cardiologists blinded to the study data.

Results: The evaluation of Spearman's Rho correlation coefficients revealed a significant, strong, and positive relationship between STAI score and SYNTAX I (r=0.757, P<0.001), as well as SYNTAX II (r=0.811, P<0.001). SYNTAX I and SYNTAX II scores were also significantly positively correlated (r=0.681, P<0.001).

Conclusion: We found a strong and significant correlation between SYNTAX I, SYNTAX II and STAI score variables. STAI score level is an independent and strong predictor of SYNTAX score and can be used a pretest indicator to identify patients with CAD.

Keywords: Syntax-I, Syntax-II, Spielberger State-Trait Anxiety Inventory, Stable angina pectoris

Öz

Amaç: Durumluk sürekli kaygı ölçeği (STAI), kaygı düzeylerini ölçmek için kullanılan bir parametredir. SYNTAX skoru, koroner arter hastalığının (KAH) ciddiyetini belirlemek için kullanılan anatomik tabanlı bir skorlama sistemidir. Çalışmamızda SYNTAX-I ve SYNTAX-II skorları ile STAI arasındaki ilişkiyi araştırdık.

Yöntemler: Anket tabanlı kesitsel bir çalışma planlandı. Hastanemize stabil anjina pektoris tanısı ile başvuran ve elektif koroner anjiyografi (KAG) uygulanan 150 ardışık hasta dahil ettik.(54 kadın ve 96 erkek). Hastalar STAI anketini KAG'den en az 1 saat önce cevaplandırdı. Çalışma verisine körlenmiş iki deneyimli kardiyolog tarafından sineangiyografik görüntüler değerlendirildi.

Bulgular: Spearman'ın Rho korelasyon katsayılarının değerlendirilmesi STAI skoru ile SYNTAX I arasında güçlü ve pozitif bir istatistiksel korelasyon olduğunu ortaya koydu (r=0,757, P<0,001). STAI skoru ile SYNTAX II de pozitif ve kuvvetli bir ilişkiye sahipti (r=0,811, P<0,001). SYNTAX I ve SYNTAX II arasındaki pozitif ilişkinin istatistiksel olarak anlamlı olduğu bulunmuştur (r=0,681, P<0,001).

Sonuç: Çalışmamızda SYNTAX I, SYNTAX II ve STAI skor değişkenleri arasında güçlü ve istatistiksel olarak anlamlı bir ilişki bulunmuştur. STAI skor seviyesi, SYNTAX skorunun bağımsız ve güçlü bir ön gördürücü olabilir ve koroner arter hastalığını tanımlamak için ön test olarak kullanılabilir.

Anahtar kelimeler: Syntax-I, Syntax-II, Spielberger Durumluk-Sürekli Kaygı Ölçeği, Stabil anjina pektoris

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Introduction

Coronary artery disease (CAD) is common in the general population and affects majority of the adults older than 60 years of age. CAD is estimated to result in 17.3 million deaths per year worldwide [1,2]. Although CAD death rates have decreased in the last 40 years, it remains to be responsible for one third or more of the deaths in individuals older than 35 years of age [3-5]. Despite the presence of many methods for CAD diagnosis, including effort stress test, dynamic echocardiogram, cardiac ultrasound and myocardial perfusion scintigraphy, coronary angiography (CAG) is still the standard criterion for its spatial and temporal resolution superiority.

Patients to undergo CAG are hospitalized and monitored. They may feel fear, anxiety and stress while waiting for the angiography procedure. Studies reported anxiety in 82% of these patients [6,7], the incidence of which was higher than the other patients and the general population [8].

Elevated levels of anxiety cause restricted perspective on the compliance to intervention at the time of diagnosis and treatment and after hospitalization [9,10]. The state-trait anxiety inventory (STAI) is a parameter used to measure anxiety levels [11].

State anxiety can be defined as fear, nervousness, discomfort, and arousal of the autonomic nervous system induced temporarily by situations perceived as dangerous (i.e. how a person is feeling at the time of a perceived threat), while trait anxiety can be defined as a relatively enduring disposition to feel stress, worry, and discomfort. The study titled "The Relationship between Cardiac Symptoms and Anxiety" has shown the association between coronary artery disease and anxiety severity [12].

The 'Synergy Between Percutaneous Coronary Intervention (PCI) with TAXUS and Cardiac Surgery (SYNTAX) score (www.syntaxscore.com) is an anatomically based scoring system used to determine the complexity of CAD, and a guide for decision-making between coronary artery bypass grafting (CABG) surgery and PCI. The SYNTAX score is related to mortality and morbidity in stable CAD [13,14].

In this study, we investigated the relationship between SYNTAX-I and SYNTAX-II scores, which have been used in the recent years to demonstrate the severity of coronary artery disease, and STAI.

Materials and methods

Study population

The questionnaire-based cross-sectional study was conducted between January - June 2019 at a single center. The sample size of the study was calculated by power analysis, with the effect size d=0.5, Power (1-**β** err prob) = 0.85 using G*power 3.1.9.7.

Our study included a total of 150 consecutive patients (54 female and 96 male) who presented to our hospital with the diagnosis of stable angina pectoris and underwent elective CAG. CAG was performed to investigate ischemic heart disease in patients with a positive treadmill test, myocardial perfusion scintigraphy, or typical chest pain.

Exclusion criteria included known CAD, acute coronary syndromes, patients with any psychiatric disorder history who receive related medical treatment, malignancy, liver and/or kidney disease, systemic inflammatory disease.

Either a written or an oral-witnessed informed consent was obtained from all participating patients. This study was performed in accordance with the principals of the Declaration of Helsinki. The study protocol was approved by the institutional Ethics Committee of Kırşehir Ahi Evran University Medical Faculty (Ethical Committee Decision No: 2018-22/180, Approval Date. 27-11-2018).

Coronary angiography

Once the written informed consent for cardiac catheterization was obtained, coronary angiography was performed in all patients using the standard techniques.

Calculation of the SYNTAX I and SYNTAX II Scores

Cineangiographic images were assessed with Axiom (Siemens Medical Solution, Erlangen, Germany) workstation by two experienced cardiologists blinded to the study data. Each lesion with a diameter stenosis ≥50% in coronary vessels ≥1.5 mm in diameter was scored using the online SYNTAX score calculator (http://www.syntaxscore.com). If the cardiologists' opinions about the lesions differed, the ultimate score was decided by averaging the scores calculated by each cardiologist. SS1 and SS2 scores were obtained for each patient.

STAI score

Stable angina pectoris patients answered the STAI questionnaire at least 1 hour prior to elective CAG procedure. The STAI questionnaire was made by the nurse of the cardiology department who was blind to the patients. STAI is a well-standardized, 40 item questionnaire, designed as a self-report instrument for the evaluation of both state and trait anxiety.

Statements in the STAI are also rated on a four-point scale (almost never, sometimes, often, and almost always). The overall (total) score for STAI ranges from a minimum of 20 to a maximum of 80; STAI scores are commonly classified as 'no or low anxiety' (20–37), 'moderate anxiety' (38–44), and 'high anxiety' (45–80) [11].

Statistical analysis

Statistical analyses of the study were performed on Statistical Package for Social Sciences version 21.0 software for Windows (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp., USA). Normality was tested by using Kolmogorov-Smirnov and Shapiro-Wilk tests. Group comparisons were evaluated with Mann-Whitney U test. Spearman's Rho rank correlation coefficient was used to determine the relationship between variables. *P*-value <0.05 was considered significant for all statistical analyses.

Results

Descriptive statistics of the study participants are presented in Table 1 in terms of n (%). There were 96 males and 54 females (total of 150 patients) and their mean age was 56.81 (9.66) years.

Spearman's Rho correlation coefficients between the variables of SYNTAX I, SYNTAX II and STAI scores are presented in Table 2. The evaluation of these coefficients

revealed a strong and positive significant correlation between STAI score and SYNTAX I (r=0.757, $P<0.001$), as well as SYNTAX II (r=0.811, $P<0.001$). SYNTAX I and SYNTAX II scores were also significantly, positively correlated (r=0.681, $P<0.001$).

The evaluation of the effect of gender on STAI, SYNTAX I and SYNTAX II values showed that men had insignificantly higher STAI scores [35.0 (29.0−44.0)] than women [30.0 (28.75−37.25)], ($P=0.077$). The effect of gender on SYNTAX I and SYNTAX II was also insignificant ($P=0.118$, $P=0.103$). There was no statistically significant difference in terms of STAI score, SYNTAX I and SYNTAX II values between smoking and non-smoking patients, patients with and without COPD, and those with and without HT ($P>0.05$ for all). STAI score and SYNTAX II values of DM and non-DM patients were similar ($P=0.208$, $P=0.406$), however, they significantly differed in terms of SYNTAX I values ($P=0.022$). SYNTAX I value of DM patients [14.0 (9.50−16.75)] was higher than non-DM patients [7.5 (5.0−12.0)] (Table 3).

Table 1: Descriptive statistics of the variables

Variables		n (%)
Sex	Male	96 (64)
	Female	54 (36)
Smoking	No	110 (73.3)
	Yes	40 (26.7)
DM	No	122 (81.3)
	Yes	28 (18.7)
HT	No	94 (62.7)
	Yes	56 (37.3)
COPD	No	118 (78.7)
	Yes	32 (21.3)

DM: Diabetes Mellitus, HT: Hypertension, COPD: Chronic obstructive pulmonary disease

Table 2: Spearman's Rho correlation coefficients

	SYNTAX I	SYNTAX II	STAI Score
SYNTAX I	1	0.681**	0.757**
SYNTAX II		1	0.811**
STAI score			1

** Significant at 0.01 level

Table 3: Descriptive statistics of SYNTAX I, SYNTAX II and STAI score

		STAI score	SNYTAX I	SYNTAX II
Sex	Female (n=54)	30.0(28.753−7.25)	7.50(5.0−12.00)	16.5(14.75−19.00)
	Male (n=96)	35.0(29.0−44.0)	9.00(6.00−19.00)	19.00(15.0−22.00)
		$P=0.077$	$P=0.118$	$P=0.103$
Smoking	No	33.0(28.5−38.5)	9.00(5.50−14.5)	17.0(15.0−22.0)
	Yes	37.0(30.0−44.0)	9.0(5.25−14.62)	18.5(16.25−21.95)
		$P=0.668$	$P=0.295$	$P=0.127$
COPD	No	33.0(28.75−38.25)	9.0(5.0−14.25)	17.0(15.0−22.0)
	Yes	37.0(30.0−44.00)	9.0(6.0−15.00)	18.3(15.0−22.0)
		$P=0.176$	$P=0.837$	$P=0.652$
HT	No	33.0(27.75−38.0)	7.50(5.0−12.25)	17.0(15.0−22.0)
	Yes	37.0(29.0−44.0)	9.0(6.0−15.5)	17.0(15.0−22.0)
		$P=0.060$	$P=0.191$	$P=0.735$
DM	No	33.0(28.25−39.0)	7.5(5.0−12.0)	17.0(15.0−21.77)
	Yes	35.0(30.5−45.5)	14.0(9.50−16.75)	20.3(15.0−26.75)
		$P=0.208$	$P=0.022$	$P=0.406$

COPD: Chronic obstructive pulmonary disease, HT: Hypertension, DM: Diabetes Mellitus, Values were given as median (25-75 IQR)

Discussion

In this study, the correlations between STAI score, SYNTAX I and SYNTAX II were worth noting. In daily clinical practice, using a specific questionnaire before CAG procedure provides new data on the relationship between anxiety levels and the severity of coronary artery disease. CAD is a compelling cause of death and disability in developed and developing countries. It is estimated to develop in almost half of the middle-aged men and one third of the middle-aged women in USA [15]. CAG is essential for the diagnosis of CAD. Anxiety is commonly observed in patients prior to the CAG procedure. Patients may experience fear, anxiety, and stress due to environmental factors, personal factors, and lack of information about the procedure to be performed while they wait for it.

Anxiety causes the secretion of norepinephrine and epinephrine by activating the sympathetic nervous system through a series of physiological and biochemical pathways. As result, heart rate, blood pressure, respiratory rate and myocardial oxygen need increase.

Depression state and anxiety are strongly correlated with CAD. Anxiety is quite common among these patients. In a study investigating the clinical value of anxiety in these patients, a relationship was shown between anxiety and cardiac symptom indicators (nocturnal angina, nitroglycerin use, shortness of breath and angina frequency) [12].

We evaluated the extent and severity of CAD with the SYNTAX score, the most popular scoring tool. The SYNTAX score is vital in determining the treatment strategy by detecting the anatomical extent of CAD. It is also an independent predictor of overall vascular mortality, cardiac death, myocardial infarction, and target vessel revascularization ratio in patients with acute coronary syndrome [16,17].

In a study by Rutledge et al. [12] evaluating anxiety and the severity of coronary artery disease, Gensini score was used instead of SYNTAX and only female patients were included. Authors concluded that anxiety should be addressed more carefully in female patients with suspected CAD. The most recent studies and meta-analyses support associations between anxiety, CAD incidence and cardiac events in both genders [18-20].

The relationship between anxiety and CAD is debatable. Cardiac symptoms can cause anxiety, symptom sensitivity may be increased among patients with anxiety and direct physiological changes due to anxiety may be observed [21].

There are different anxiety scorings available in the evaluation of the anxiety levels. Mei et al. [22] assessed the anxiety level by using Hamilton Anxiety Rating Scale (HAM-A) in patients to undergo CAG. The HAM-A is a clinician-based questionnaire; however, being available in the public domain, it has been employed as a self-scored survey. It consists of 14 symptom-defined elements and caters for both psychological and somatic symptoms [23]. For the scoring of HAM-A based on symptoms, STAI, designed as a self-report instrument for the evaluation of both state and trait anxiety, was used.

The presence and extent of CAD closely affects human health and the cost of treatment [24].

In our study, there was a correlation between anxiety levels and CAD in patients with stable coronary artery disease. For CAD diagnosis, anxiety level can be used as a new parameter in addition to others including effort stress test, dynamic echocardiogram, cardiac ultrasonography, and myocardial perfusion scintigraphy.

Limitation

There were some obvious limitations in the current study. First, our study population is relatively small and future studies conducted on larger populations may yield a correlation between STAI and SYNTAX I and SYNTAX II scores in stable angina pectoris patients. Secondly, this is a single-center study and demographic, genetic, and racial features of our patient cohort display distinctions from that of other centers.

Future perspective

Dynamic echocardiogram, effort stress test, cardiac ultrasound and myocardial perfusion scintigraphy are the currently used noninvasive pretests for the diagnosis of CAD. The addition of STAI anxiety score to non-invasive tests can increase the pre-test probability of non-invasive tests.

Conclusion

In our study, a strong and statistically significant correlation was found between SYNTAX I, SYNTAX II and STAI score variables. STAI score is associated with a higher SYNTAX score in patients with stable CAD. STAI score level is an independent and strong predictor of the SYNTAX score and may be used as a pre-test indicator to identify patients with CAD at an elevated risk for atherosclerotic burden.

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