Dicle Tıp Dergisi / Dicle Med J (2021) 48 (4) : 782-787

www.diclemedj.org

Original Article / Özgün Araştırma

Evaluation Of The Relationship Between Mitral Annular Plane Systolic Function (Mapse) and Syntax Score In Non-St Elevation Myocardial Infarction

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Received: 24.08.2021; Revised: 17.11.2021; Accepted: 22.11.2021

Abstract

Objective: Acute coronary syndromes (ACS) are still the main cause of mortality in the world. Scoring systems are important for risk evaluation in ACS. Angiographic The Synergy between Percutaneous Coronary Intervention (SYNTAX) score is universal. For cardiac pump function, left ventricular (LV) longitudinal shortening has a major role. It can be assessed by some echocardiographic parameters. Mitral annular plane systolic excursion (MAPSE) is well defined for the LV longitudinal function evaluation and clues with LV systolic function. In this study, we aimed to research the relationship between SYNTAX score and MAPSE in Non-ST elevation myocardial infarction (NSTEMI) patients.

Methods: 138 consecutive patients who underwent coronary angiography after diagnosis of NSTEMI were included. Transthoracic echocardiography was performed to all patients by an experienced physician who was uninformed patient's data. Coronary angiography via the femoral approach was performed for all patients within 48 hours. ≥ 50% coronary lesion stenosis in vessels ≥ 1.5 mm was scored separately and SYNTAX scores were obtained.

Results: The median age was 64.5 (54.0-70.8) years and 80.4% were male. Hypertension was the most common risk factor (72.5%). Left anterior descending artery (LAD) stenosis was the most common artery stenosis (58.7%). The mean MAPSE was 14.0 (13.0-15.8) and the mean SYNTAX score was 10.0 (7.0-14). Correlation of our outcome variable SYNTAX score between physiological and clinical variables of age, troponin and LVEF were calculated. No significant p value was detected. The relationship between SYNTAX Score and categorical variables such as gender, hypertension, diabetes mellitus, hyperlipidemia, left main coronary artery (LMCA), LAD, right coronary artery (RCA), circumflex artery (CX), peripheral arterial disease (PAD) was evaluated. None of the variables included in the regression model were associated with the SYNTAX score

Conclusion: In this study, we have investigated the relationship between MAPSE and SS in NSTEMI patients. No significant correlation was found between MAPSE and SS.

Keywords: Mitral annular plane systolic excursion (MAPSE), SYNTAX score, Non-ST elevation myocardial infarction

DOI: 10.5798/dicletip.1037638

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St Elevasyonsuz Miyokard İnfarktüsü Hastalarında Mitral Anuler Plan Sistolik Fonksiyonu (Mapse) ve Syntax Skoru Arası İlişkinin Değerlendirilmesi

Öz

Giriş: Akut koroner sendromlar (AKS) hala en önemli ölüm nedenidir. AKS'de risk değerlendirmesi için skorlama sistemleri geliştirilmiştir. Angiographic The Synergy between Percutaneous Coronary Intervention (SYNTAX) skoru en yaygın kullanılan evrensel anjiografik skorlama sistemidir. Kardiyak pompa işlevi için, sol ventrikül (LV) longitudinal kısalmanın önemli bir rolü vardır. Longitudinal kısalma, bazı ekokardiyografik parametrelerle değerlendirilebilir. Mitral anüler düzlem sistolik hareketi (MAPSE), LV boylamsal fonksiyon değerlendirmesi için tanımlanmıştır ve LV sistolik fonksiyonu değerlendirmesinde yol gösterici olabilir. Bu çalışmada NSTEMI hastalarında SYNTAX score ve MAPSE arasındaki ilişkiyi araştırmayı amaçladık.

Yöntemler: Çalışmaya, NSTEMI tanısı konulduktan sonra koroner anjiyografi yapılan ardışık 138 hasta dahil edildi. Hasta verileri hakkında bilgi sahibi olmayan deneyimli bir hekim tarafından tüm hastalara transtorasik ekokardiyografi yapıldı. Tüm hastalara 48 saat içinde femoral arterden koroner anjiyografi yapıldı. ≥ 1.5 mm damarlarda ≥ %50 koroner lezyon stenozu ayrı ayrı skorlandı ve SYNTAX skorları elde edildi.

Bulgular: Ortalama yaş 64.5 (54.0-70.8) yıl ve %80.4'ü erkekti. Hipertansiyon en sık görülen risk faktörüydü (%72.5) . Sol ön inen arter (LAD) darlığı en sık görülen arter darlığıydı (%58.7). Ortalama MAPSE 14.0 (13.0-15.8) ve ortalama SYNTAX skoru 10.0 (7.0-14) idi. SYNTAX skorunun fizyolojik ve klinik değişkenler olan yaş, troponin ve LVEF arasındaki korelasyonu hesaplandı. Anlamlı p değeri bulunmadı. SYNTAX Skoru ile cinsiyet, hipertansiyon, diabetes mellitus, hiperlipidemi, sol ana koroner arter (LMCA), LAD, sağ koroner arter (RCA), sirkumfleks arter (CX), periferik arter hastalığı (PAD) gibi kategorik değişkenler arasındaki ilişki değerlendirildi. Regresyon modelinde yer alan değişkenlerin hiçbirisinin SYNTAX skoru ile anlamlı bir korelasyonu çıkmadı.

Sonuç: Bu çalışmada NSTEMI hastalarında MAPSE ve SYNTAX score arasındaki ilişkiyi araştırdık. MAPSE ve SYNTAX score arasında anlamlı bir ilişki bulunamadı.

Anahtar kelimeler: Mitral anüler plan sistolik hareketi, Syntax skoru, ST elevasyonsuz miyokard infarktüsü.

INTRODUCTION

Acute coronary syndromes (ACS) are still the main cause of mortality in the world. Scoring systems are important for risk evaluation in ACS[1-2]. Angiographic The Synergy between Percutaneous Coronary Intervention (SYNTAX) score is universal. It determines complexity and degree of coronary artery disease (CAD) and it is also useful to predict outcome. While coronary artery bypass graft (CABG) is recommended for a high SYNTAX score, a choice can be made between percutaneous coronary intervention (PCI) or CABG for a low and medium SYNTAX score[3].

Left ventricular (LV) longitudinal shortening has a major role for cardiac pump function. It can be assessed by some echocardiographic parametres[4-6]. MAPSE is well defined for the LV longitudinal function evaluation and clues with LV systolic function[7,8]. MAPSE, which demonstrates systolic mitral ring movement can assess global cardiac longitudinal function. Also, it is sensitive to identify pathologies in various cardiovascular diseases at early phase where longitudinal function is impaired before another parametres[9-11].

In this study, we aimed to research the relationship between SS and MAPSE in NSTEMI patients.

METHODS

138 consecutive patients who underwent coronary angiography after diagnosis of NSTEMI between September 2020 - April 2021 were included in the study. NSTEMI was diagnosed in patients with typical chest pain for at least 20 minutes and high troponin I values, with or without new horizontal ≥ 0.05 mV ST depression in at least 2 adjacent leads[12]. Patients with active infection, chronic inflammatory disease, prior CAD, malignancy, pulmonary hypertension, severe valvular heart disease, Killip class III–IV heart failure were excluded. Patients have informed written consent and ethics committee conceded the

study in accordance with the Helsinki Declaration principles. (ethics committee page number 2021/9/509).

Venous blood samples were collected to perform laboratory analysis from all patients. Complete blood counts were measured. Blood urea nitrogen, glucose, creatinine, Troponin I, total cholesterol, triglyceride, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) levels were also measured.

Echocardiography

Transthoracic echocardiography was performed to all patients by an experienced physician who was uninformed patient's data. Two-dimensional (2D) images were evaluated in the apical four and two chamber views (4C and 2C views). LV ejection fraction (LVEF) was determined by visual estimation of EF, and confirmed with Simpson's method. M-mode images were get at the LV anterior, posterior, lateral, septal limits of the mitral ring in the apical 4C and 2C views, and mean MAPSE was computed. LV septal wall peak systolic velocity (TDIs) recorded with Pulsed-wave (PW) tissue Doppler in the apical 4C view at the level of the mitral annulus. Transmitral velocities were calculated in the 4C view with PW Doppler. E and A velocity, E/A ratio were calculated for LV diastolic function. LV septal wall diastolic velocities (é) evaluated with PW tissue Doppler in the apical 4C view at the mitral annulus level. The E/é ratio was calculated. Septal é <8cm/s showed diastolic dysfunction. Images were recorded for 3 cycles and their average values were taken.

SYNTAX Score and Coronary Angiography

Coronary angiography via the femoral approach was performed for all patients within 48 hours. Multiple projection images were recorded for the right and left coronary arteries. Two experienced and independent interventional cardiologists evaluated the coronary angiograms. ≥ 50% coronary lesion stenosis in any vessel ≥ 1.5 mm was scored separately and SYNTAX scores were obtained (www.syntaxscore.com). Demographic informations, laboratory, electrocardiographic, angiographic and echocardiographic parameters were recorded and compared between patients with low (≤ 22) and high SS (> 22).

RESULTS

138 patients were enrolled. The median age was 64.5 (54.0-70.8) years and 80.4% were male. Hypertension was the most common risk factor (72.5%). Left anterior descending artery (LAD) stenosis was the most common artery stenosis (58.7%). The mean MAPSE was 14.0 (13.0-15.8) and the mean SS was 10.0 (7.0-14). Other clinical, laboratory and angiographic features are summarized in Table-1. Also, histogram curves of SS and MAPSE are shown in Figure-1.

Table I: Clinical, laboratory and angiographic features of the individuals included in the study

	n=138
Male	111 (80.4)
Age, years	64.5 (54.0-70.8)
Smoking	85 (61.6)
Hypertension	100 (72.5%)
Diabetes mellitus	59 (42.8%)
Hyperlipidemia	64 (46.7%)
Peripheral arterial disease	10 (7.2%)
White blood cell count	9 (7.50-10.7)
Hemoglobin	14.1 ± 1.92
Neutrophil	5.50 (4.17-7.16)
Lymphocyte	2.40 (1.90-3.00)
Urea	37.7 ± 15.0
Creatinine	0.90 ± 0.10
Troponin	0.04 (0.02-0.14)
Left ventricular ejection fraction	65.0 (50.0-65.0)
Left main coronary artery>%50	6 (4.3%)
Left anterior descending>%70	81 (58.7%)
Left circumflex artery	78 (56.5%)
Right coronary artery	64 (46.4%)
Mitral annular plane systolic excursion	14.0 (13.0-15.8)
Syntax score	10.0 (7.0-14)

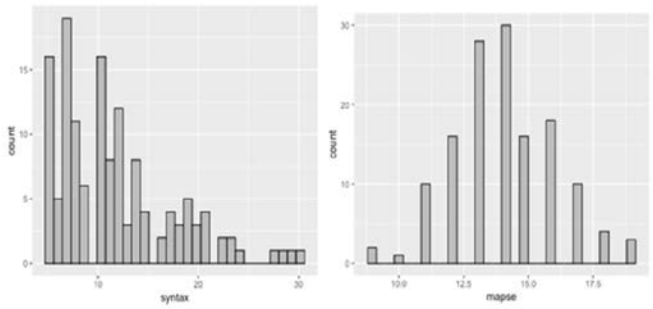

Figure-1. Histogram curve showing the frequency distribution of the Syntax score and MAPSE

Correlation of our outcome variable SS between physiological and clinical variables of age, white blood cell (WBC), hemoglobine, neutrophil, lymphocyte, creatinine, troponin and LVEF were calculated. No significant p value was detected (Table 2).

Table II: Correlation between Syntax score and age, wbc, hgb, neu, lym, creatinine, troponin and LVEF

	r value	p value
Age	r: -0.0637	p: 0.4581
White blood cell count	r: -0.0622	p: 0.4688
Hemoglobin	r: 0.0919	p: 0.2839
Neutrophil	r: -0.1402	p: 0.1009
Lymphocyte	r: 0.1229	p: 0.1509
Creatinine	r: 0.0269	p: 0.7543
Troponin	r: -0.0388	p: 0.6516
Left ventricular ejection fraction	r: 0.0591	p: 0.4914
Mitral annular plane systolic excursion	r: -0.0525	p: 0.5410

The relationship between SS and categorical variables such as gender, HT, DM, HL, left main coronary artery (LMCA), LAD, right coronary artery (RCA), circumflex artery (CX), peripheral arterial disease (PAD) was evaluated with the Mann-Whitney U test. No statistical difference was found for SS between smokers and non-smokers (p = 0.164), between men and women (p = 0.505), with and without DM (p = 0.092), with and without HT (p = 0.151), with and without HL (p = 0.472), and with and without PAD (p = 0.419). Accordingly; DM, HT, smoking, neutrophil and lymphocyte counts with p value <0.20 were included in the multivariate linear regression analysis. However, none of the variables included in the regression model were associated with the SS (Table 3).

Table III: Multivariate lineer regression analysis according for variables relation to Syntax score

	Beta	Standard deviation	T value	p value
Smoking	0.6771	1.0806	0.627	0.532
Hypertension	-0.7318	1.1847	-0.618	0.538
Diabetes mellitus	-1.4278	1.0245	-1.394	0.166
Neutrophil	-0.1346	0.2047	-0.658	0.512
Lymphocyte	0.6650	0.5360	1.241	0.217

DISCUSSION

In this study, we have investigated the relationship between MAPSE and SS in NSTEMI patients. No significant correlation was found between MAPSE and SS. Although MAPSE is an echocardiographic parameter that can be performed easily and quickly, it was not sufficient to detect the severity and extent of CAD in NSTEMI patients in our study.

SS is calculated based on the number and functional impact of lesions, complexity, coronary vasculature and location[13]. SS requires invasive intervention. Therefore, different parameters that do not require invasive intervention were also investigated to predict prognosis and CAD burden in NSTEMI. For example, a correlation was found between

increased high sensitive C-reactive protein and high SS in ACS patients[14]. A correlation was determined between the P wave peak time on admission electrocardiography and the severity and complexity of CAD in NSTEMI patients[15]. Neutrophil to lymphocyte ratio and Apolipoprotein A1 are associated with SS and CAD severity in patients with NSTEMI[16,17].

Also, Ozturk Fatih et all showed that, epicardial fat tissue (EAT) thickness was greater in the patients with ACS compared with control group and established a significant correlation with SS[18].

Cardiac disorders reduce radial and longitudinal contractile functions. However, in some pathological conditions, it has been reported that primarily long axis myocardial function is impaired. MAPSE, which may decrease even when LVEF remains normal, is a way of assessing LV longitudinal function. In addition, longitudinal assessment of myocardial function may be helpful in the diagnosis of subclinical LV systolic dysfunction[19-21]. There are clinical studies related to MAPSE. Alam et al. found significant correlation between EF and MAPSE[22]. Rydberg et al. reported that the reduction of MAPSE is predictor for the aortic stenosis degree[23].

Correlation was found between MAPSE and LV wall motion index in CAD patients. Alam et all also reported decreased MAPSE in AMI patients, more pronounced in infarct areas, compared to controls[24]. In our clinical study, a relationship between MAPSE and SS was investigated, but no significant relationship was found. According to this; although MAPSE may be a guide in terms of prognosis in AMI patients, it may not be sufficient to show the extent and the severity of CAD.

Limitations

This study has a small patient population and it is in retrospective design. Although MAPSE is affected by changing fluid conditions, dynamic fluid responsiveness tests were not used. We did not use cardiac magnetic resonance for more sensitive MAPSE measurement.

CONCLUSION

Significant correlation was not found between MAPSE and SS. Although; MAPSE may be a guide for prognosis in AMI, it may not be sufficient to show the extent of CAD.

Ethics Committee Approval: Patients have informed written consent and ethics committee conceded the study in accordance with the Helsinki Declaration principles (ethics committee page number 2021/9/509).

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: No financial disclosure was declared by the authors.

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