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Original Article

Gensini skoru, pompa destekli koroner arter baypas greftleme sonrası gelişen atriyal fibrilasyonun öngördürücüsüdür

Gensini skoru pompa destekli koroner arter baypas greftleme sonrası gelişen atriyal fibrilasyonun öngördürücüsüdür

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Abstract

Aim: Postoperative atrial fibrillation (POAF) is common after coronary artery by-pass grafting surgery (CABG) and associated with adverse events. GENSINI score is a widely-used scoring system that quantifies angiographic atherosclerosis. The value of GENSINI score to predict POAF has not been studied previously. Aim of this study was to evaluate this relationship in our patients undergoing on-pump CABG surgery.

Material and Methods: In this retrospective, single-center study, a total of 113 patients without exclusion criteria were included. Demographic and clinical characteristics of patients were recorded and GENSINI scores were calculated. Univariate and multivariate logistic regression analyses were performed to identify the independent predictors of POAF.

Results: Postoperative atrial fibrillation developed in 34 (30%) patients. Multivariate logistic regression analyses revealed that C-Reactive Protein [ß=0.037, p=0.011, OR=1.03, 95% CI (1.008-1.065)] and GENSINI score [ß=0.015, p=0.024,OR=1.012, 95% CI (1.002-1.028)] are independent predictors of POAF. The ROC analysis showed an area under the curve of 0.587 (p=0.012). GENSINI score of > 50.75 had 82.4% sensitivity in predicting POAF [p=0.012, 95%CI (0.464-0.711)].

Conclusion: Our results showed that GENSINI score is an independent predictor of POAF in patients undergoing on-pump CABG surgery.

Keywords: Atrial fibrillation; coronary artery bypass grafting; gensini score

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Öz

Amaç: Postoperatif atriyal fibrilasyon (POAF), koroner arter baypas cerrahisi (CABG) sonrası sıktır ve istenmeyen olaylarla ilişkilidir. GENSINI skoru anjiyografik aterosklerozu derecelendirmek için yaygın olarak kullanılan bir skorlama sistemidir. POAF gelişiminin öngörülmesinde GENSINI skorunun rolü daha önce araştırılmamıştır.

Bu çalışmada pompa destekli CABG yapılan hastalarda POAF gelişiminin öngörülmesinde GENSINI skorunun rolünün değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Tek merkezde gerçekleştirilen bu retrospektif çalışmaya dışlama kriterleri olmayan 113 hasta dahil edildi. Demografik ve klinik özellikleri kaydedildi. GENSINI skorları hesaplandı. Postoperatif atriyal fibrilasyon gelişimi öngördürücülerini belirlemek amacıyla tek değişkenli ve çok değişkenli lojistik regresyon analizi yapıldı.

Bulgular: Hastaların %30'unda POAF gelişti. Çok değişkenli lojistik regresyon analizinde C-Reaktif Protein [ß=0.037, p=0.011, OR=1.03, 95% CI (1.008-1.065)] ve GENSINI skorunun [ß=0.015, p=0.024,OR=1.012, 95% CI (1.002-1.028)] postoperatif atriyal fibrilasyon gelişiminin bağımsız öngördürücüleri olduğu bulundu. Alıcı işletim karakteristiği (ROC) analizinde eğri altında kalan alan GENSINI skoru için 0.587 olarak hesaplandı. GENSINI skorunun 50.75' in üzerinde olmasının POAF gelişiminin öngörülmesinde % 82.4 duyarlılığa sahip olduğu saptandı [p=0.012, 95%CI (0.464-0.711)].

Sonuç: Çalışmamızda GENSINI skorunun pompa destekli bypass cerrahisi uygulanan hastalarda POAF gelişiminin bağımsız bir öngördürücüsü olduğu bulunmuştur.

Anahtar kelimeler: Atriyal fibrilasyon; koroner arter baypas greftleme; gensini skor

Introduction

Postoperative atrial fibrillation (POAF), defined as an electrocardigraphically (ECG) verified episode which lasts longer than 60 seconds during the first seven postoperative days, is the most common arrhythmia following coronary artery bypass grafting surgery (CABG) [1,2]. POAF is associated with thromboembolic events, myocardial ischemia, heart failure, prolonged hospital stay and mortality [3]. POAF is a multifactorial and generally transient condition and its incidence varies from 5% to 40% between series [2-4]. Although the multifactorial nature of POAF is well known, the relation between POAF and severity of coronary artery disease is not well established.

The GENSINI score is a widely-used scoring system that quantifies angiographic atherosclerosis that accounts for the degree of artery narrowing as well as locations of narrowing [5,6].

The present study aimed to evaluate the role of GENSINI score in predicting POAF.

Material and Methods

This was a single-center retrospective study. Medical records of 239 patients who underwent on-pump coronary artery bypass grafting in our hospital between January 2017-November 2018 were evaluated retrospectively. The research protocol was approved by the local ethics committee.

Patient Selection

Patients with a history of preoperative atrial fibrillation, ST-segment elevated myocardial infarction (STEMI), concomitant valve surgery, redo surgery, off-pump surgery, chronic obstructive pulmonary disease, known thyroid disease, chronic inflammatory disease, and preoperative ejection fraction <35% were excluded. Preoperative demographics and clinical characteristics of the patients were recorded. The study was performed in accordance with the Declaration of Helsinki's Good Clinical Practice guidelines and approved by the local ethical committee.

GENSINI Score Calculation

The GENSINI score was calculated for each patient by two experienced cardiologists who were blinded to the study. In case of disagreement, the score was controlled by a third observer and the final decision was made by consensus.

GENSINI score grades stenosis of the coronary arteries as follows: 1, 1%– 25% occlusion; 2, 26%–50% occlusion; 4, 51%–75% occlusion; 8, 76%–90% occlusion; 16, 91%–99% occlusion; and 32, total occlusion. This score is multiplied by a factor accounting for the importance of the lesion position in the coronary arterial tree, such as 5 for the left main coronary artery, 2.5 for the proximal segment of the left anterior descending coronary artery, 2.5 for the proximal segment of the circumflex artery, 1.5 for the mid-segment of the left anterior descending coronary artery, 1.0 for the right coronary artery, the distal segment of the left anterior descending coronary artery, the posterolateral artery, and the obtuse marginal artery, and 0.5 for other segments. The severity of the disease is expressed as the sum of the scores for individual lesions [5].

Volume 10 Number 4 p: 447-451

We independently examined 25 randomly chosen angiograms, visually estimated lesion scores, and calculated GENSINI scores. The intra-observer and inter-observer correlation coefficient were 0.95 and 0.94 for the GENSINI score, indicating good reproducibility and reliability.

Statistical analyses

Data were analyzed by SPSS 21.0 (IBM Corporation, Armonk, NY, USA) software. Categorical variables were expressed as number and percentage. Data were expressed in mean ± standard deviation and median (range) for continuous variables and percentage for categorical variables. Continuous variables were checked with Kolmogorov–Smirnov normality test to demonstrate distribution. Continuous variables with normal distribution were compared using the unpaired Student's t-test. Continuous variables with abnormal distribution were compared using the Mann– Whitney U test. Chi-square test was used to compare categorical variables. Univariate and multivariate logistic regression analyses were performed to identify the independent predictors of POAF. A p-value of less than 0.05 was considered statistically significant. The receiver operating characteristic (ROC) analysis was used to determine the discriminative ability of GENSINI score for POAF development.

Results

A total of 113 patients without exclusion criteria were included in the study. Postoperative atrial fibrillation developed in 34 (30%) patients. It was most common within 24-48 hours of surgery. Clinical characteristics, laboratory parameters, echocardiographic, and perioperative features of the patients are seen in Table 1. Age (68.8±9.8 to 73.0±9.8, p=0.036), GENSINI score (69.4±28.1 to 80.4±34.3, p=0.012), High-density lipoprotein (HDL) (39.5±8.2 to 43.2±9.9, p=0.04), C-reactive protein (CRP) levels (11.7±8.3 to 17.2±11.2, p=0.026) were significantly different between patients with and without POAF. Perioperative medications and operative variables were similar between groups. Basic echocardiographic parameters were also similar. Left atrium diameter was slightly higher in POAF group but this difference did not reach statistical significance (p=0.051). The median length of hospital stay was [6 (5-8) days to 8 (7-21) days, p<0.001]. Multivariate logistic regression analyses revealed that CRP [ß=0.037, p=0.011, OR=1.03, 95% CI (1.008-1.065)] and GENSINI score [ß=0.015, p=0.024, OR=1.012, 95% CI (1.002-1.028)] are independent predictors of POAF (Tables 2). The ROC analysis showed an area under the curve of 0.587 (p=0.012). GENSINI score of > 50.75 had 82.4% sensitivity and 20.3% specificity in predicting POAF [Area under curve: 0.587, p=0.012, 95%CI (0.464-0.711)] (Figure 1).

Table 1. Comparison of variables between groups

	POAF (-) (n=79)	POAF (+)(n=34)	P values
Clinical characteristics			
Age (years), mean±SD	68.8±9.8	73.0±9.8	0.036
Male, n (%)	70 (88.6)	25 (73.5)	0.054
Hypertension, n (%)	60 (75.9)	22 (64.7)	0.254
Diabetes mellitus, n (%)	35 (44.3)	15 (44.1)	1.0
Sigara, n (%)	51 (64.6)	23 (67.6)	0.703
CHA2Ds2VASc score	2.9±1.3	3.4±1.6	0.09
Mean GENSINI Score	69.4±28.1	80.4±34.3	0.012
Laboratory parameters			
Median Hb (g/dL) (minimum—maximum)	14.1 (9.0-17.4)	13.6 (8.7-17.0)	0.74
White blood cell (µL)	8.3±1.9	8.1±2.8	0.65
Platelet (103 /µL)	238.4±65.8	227.2±48.1	0.37
Low-density lipoprotein (mg/dL)	121.4±45.3	112.6±37.1	0.28
High-density lipoprotein (mg/dL)	39.5±8.2	43.2±9.9	0.040
Median Trigliserit (g/dL) (minimum—maximum)	154 (42-565)	147 (55-302)	0.27
Creatinine (mg/dL)	1.4±0.8	1.3±0.7	0.18
C-reactive protein (mg/dL)	11.7±8.3	17.2±11.2	0.026
Medications			
Beta blocker, n (%)	58 (73)	23 (68)	0.649
ACEI/ARB, n (%)	40 (51)	20 (59)	0.538
Statin, n (%)	68 (86)	26 (76)	0.273
Basic Echocardiographic parameters			
Left ventricular ejection fraction (%)	50.2±7.9	50.1±9.4	0.97
Left ventricle diastolic dysfunction, n (%)	67 (85)	27 (79)	0.89
Left atrium diameter (cm)	3.9±0.4	4.4±0.5	0.051
Intraoperative variables			
Total number of grafts	4.1±1.4	3.7±1.2	0.107
Aortic cross-clamp time (min)	85±37	79±32	0.253
Usage of LIMA, n (%)	78 (98)	33 (97)	1.0
Total bypass time (minutes)	139±41	142±53	0.96

Table 2. Predictors of POAF in multivariate logistic regression analysis.

Variable	Beta	OR	95% CI	P values
Age	0.041	1.04	0.976-1.082	0.304
Sex	0.589	1.803	0.498-6.530	0.370
GENSINI Score	0.015	1.012	1.002-1.028	0.024
High-density lipoprotein	0.057	1.061	1.009-1.116	0.092
C-reactive protein	0.037	1.03	1.008-1.065	0.011
Left atrium diameter	0.924	2.518	0.891-7.114	0.081

POAF: Postoperative atrial fibrillation, CI: Confidence Interval

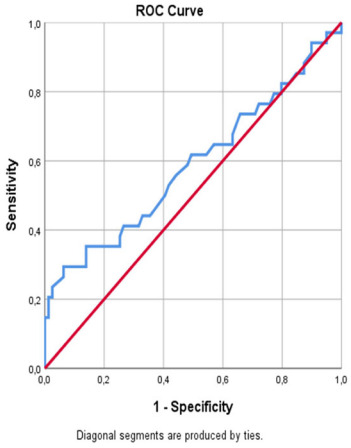

Figure 1 Legend: Receiver operating characteristic analysis comparing the performance and predictive accuracy of GENSINI Score for POAF. (Area under the curve: 0.587, 95%CI (0.464-0.711), p=0.012)

Discussion

Results of our study showed that CRP and GENSINI score are independent predictors of POAF following isolated on-pump CABG surgery. To the best of our knowledge, this is the first study reporting the association between GENSINI score and POAF incidence following isolated on-pump CABG.

Atrial fibrillation is the most common arrhythmic complication after cardiac surgery associated with an increased hospital stay, health care costs and mortality [3,8]. In accordance with literature hospital stay was longer among our patients with POAF. Postoperative atrial fibrillation typically occurs within the first four postoperative days [2]. The most common duration was 24 to 48 hours among our patients. Age, anemia, hypoxia, left atrial dilatation, left ventricular dysfunction, severe coronary artery disease (CAD), hypertension, type of cardiac surgery, increased sympathetic activation, oxidative stress and inflammation are the risk factors thought to be associated with POAF. But the main pathophysiology is not clear and thought to be multifactorial [2,9]. Postoperative atrial fibrillation is also associated with postoperative complications, therefore, it is important to develop risk prediction models. GENSINI score is a widely-used means of quantifying angiographic atherosclerosis, where a zero score indicates the absence of atherosclerotic disease. The GENSINI score accounts for the degree of artery narrowing as well as locations of narrowing [5]. Previously GENSINI score was found to be associated with in-hospital mortality in patients with STEMI undergoing primary percutaneous coronary intervention [10]. In another study, Avci et al. showed that GENSINI score is independently associated with the severity of carotid stenosis in patients undergoing CABG [7]. Although it has been widely used in clinical trials to assess the extent and severity of CAD, the role of GENSINI score in predicting POAF has not been investigated previously [10].

Age found to be the most significant predictor of POAF in previous studies [2,11]. Aging causes structural changes like atrial scarring and non-structural changes like increased sympathetic activity and prolonged atrial conduction time [12]. These changes may also contribute to the development of POAF. We also found that age is significantly different between patients with or without POAF.

Although the severity of coronary artery disease is thought to be an additional risk factor for POAF, literature data is contradictory [13]. Previously Gecmen et al. showed a correlation between higher SYNTAX scores and POAF in patients undergoing isolated on-pump CABG [14]. Another study found no significant difference between high and low SYNTAX score groups for the development of POAF [15]. In our study, we found that GENSINI score is an independent predictor of POAF. One of the limitations of using the GENSINI score for risk stratification is the absence of any clinical variables such as age, left ventricular functions and renal impairment.

Study limitations

There are several limitations of our study. It was based on retrospective analysis and we only examined a group of consecutive patients who were scheduled for CABG. Secondly, it was a single-center study and our study population was relatively small. Patients' long-term follow up data were not systematically

recorded. Besides, because morbidity and mortality outcomes were outside the scope of this study, the predictive value of GENSINI score on these parameters is not known.

Conclusion

Our findings suggest that GENSINI score can be used to predict POAF. Of course, no single risk models can be accepted as the gold standard in predicting POAF and also, no risk models may guide about the prediction of serious complications related to POAF. But we think that GENSINI score may be used not only validating the severity of CAD, and also predicting POAF occurrence with 82.4% sensitivity according to our results.

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