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ORIGINAL ARTICLE

Correlation of fragmented QRS complexes with the severity of CAD (using Syntax score) in patients with non-ST elevation acute coronary syndromes

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KEYWORDS

Fragmented QRS (f-QRS); Non-ST elevation acute coronary syndromes

Abstract *Background:* Fragmented QRS (f-QRS) complexes are novel electrocardiographic signals, which reflect myocardial conduction delays in patients with coronary artery disease (CAD). The significance of f-QRS complexes in non-ST elevation ACS patients for detection of the severity of CAD (correlation with Syntax score) was evaluated in this prospective study.

Methods: A total of 104 patients with non-ST-elevation ACS who underwent invasive coronary angiography for detection of coronary artery disease were recruited prospectively in this study, ECG was done to all patients, which showed f-QRS in 50 patients (f-QRS group) and inverted T wave or depressed ST in 54 patients (non f-QRS group). The significance of f-QRS complexes on 12-lead ECG for detection of the severity of the CAD (correlated with Syntax score) was assessed in this cohort of patients.

Results: Among the patients studied, elderly patients (age $\geqslant$ 65 years), males, diabetics, smokers and those with dyslipidemia had a significantly higher frequency of fQRS complexes (with *P* value = 0.02, 0.01, 0.019, 0.005, 0.02 respectively). Also, the present study found a higher frequency of f-QRS in patients with multi-vessel disease, in those with more severe degree of coronary artery stenosis, in those with positive Troponin I level and in those with high Syntax score (with *P* value = 0.009, 0.000, 0.000 respectively).

Abbreviations: NSTE-ACS, non-ST elevation acute coronary syndrome; UA, unstable angina; NSTEMI, non-ST elevation myocardial infarction; STEMI, ST elevation myocardial infarction; MI, myocardial infarction; ACS, acute coronary syndrome; CAD, coronary artery disease; ECG, electrocardiography; BP, blood pressure; f-QRS, fragmented QRS; CT, computed tomography; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; LV, left ventricle; RV, right ventricle; IHD, ischemic heart disease; PPV, positive predictive value; VD, vessel disease; CI, confidence interval; SYNTAX, Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery; LAD, left anterior descending artery; LCX, left circumflex artery; RCA, right coronary artery; LM, left main artery; PDA, posterior descending artery

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Conclusions: The frequency of f-QRS complexes was found to be higher in elderly, diabetic, dyslipidemic, and male patients with NSTE-ACS. The higher frequency of (f-QRS) was correlated with the extent and severity of coronary lesions in patients with NSTE-ACS.

1. Introduction

Non-ST elevation ACS refers to partial or near complete occlusion of a coronary artery resulting in compromised blood flow to the myocardium with subsequent myocardial injury. NSTE-ACS patients have varying degrees of coronary obstruction, undergo more heterogeneous management and have worse long-term outcomes.[1] While cardiogenic shock, heart failure and arrhythmias may be less than in STEMI, NSTE-ACS patients suffer more recurrent events and worse long-term outcomes[2] (see Fig. 1).

The ECG remains the most immediately accessible and widely used diagnostic tool for guiding emergent treatment strategies. The ECG recorded during acute myocardial ischemia is of diagnostic, therapeutic and prognostic significance.

There is clearly a need to determine subgroups of patients having anatomically or functionally severe coronary obstruction based on standard 12-lead ECG interpretation.[3]

Fragmented QRS (f-QRS) complexes are novel electrocardiographic signals which reflect impaired ventricular depolarization due to heterogeneous electrical activation of ischemic and/or injured ventricular myocardium. Fragmented QRS (fQRS) is a convenient marker of myocardial scar evaluated by 12-lead electrocardiogram (ECG) recording. fQRS is defined as additional spikes within the QRS complex.[4]

Fragmented QRS complexes (f-QRS) on a 12-lead resting ECG include an additional R wave (R′), notching of the R wave, notching of the down stroke or upstroke of the S wave, or the presence of >1 R′ in 2 contiguous leads corresponding to a major coronary artery territory.[5]

In this study, we reviewed the ECG results in NSTE-ACS patients to evaluate the accuracy of f-QRS complexes to identify severity and complexity of CAD lesions assessed by SYNTAX score.

2. Methods

2.1. Study population

One hundred and four patients admitted to cardiology department Assiut university hospital from May, 2014 to October, 2014 with non-ST elevation ACS were enrolled in this prospective study.

A written consent was taken from every patient before enrollment and the protocol was approved by the local ethics committee of our institution.

Each patient was subjected to thorough clinical history including risk factors for CAD (age, sex, hypertension, smoking, diabetes mellitus and hyperlipidemia), of significant CAD (prior myocardial infarction or typical angina pectoris), and previous percutaneous coronary intervention (PCI). Standard 12-lead ECG, cardiac biomarkers, echocardiographic and coronary angiography (CAG) findings were collected from the study subjects.

The patients excluded from the study were those with left & right bundle branch block (weather complete or incomplete), permanent atrial fibrillation, ventricular paced rhythm, a previously implanted implantable cardioverter–defibrillator (ICD), left ventricular hypertrophy, Wolff–Parkinson–White syndrome, cardiomyopathy, myocarditis, congenital heart disease and previous myocardial infarction and coronary artery bypass surgery (CABG).

2.2. Electrocardiography

Standard 12-lead ECG was recorded at a 25 mm/s paper speed and a gain of 10 mm/mV with the patient fully relaxed in the supine position.

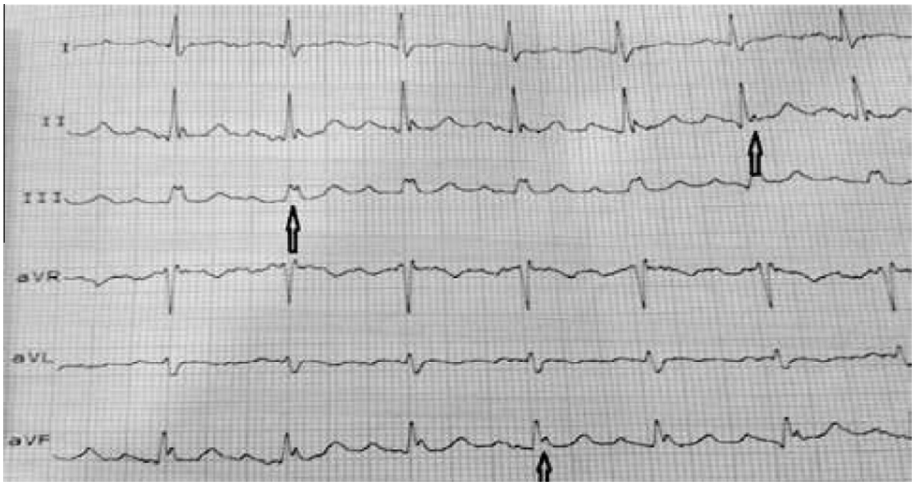

Figure 1 f-QRS in inferior leads.