



ORIGINAL ARTICLE

## The presence of fragmented QRS is associated with increased epicardial adipose tissue and subclinical myocardial dysfunction in healthy individuals



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### KEYWORDS

Fragmented QRS;  
Epicardial adipose  
tissue;  
Myocardial  
dysfunction;  
Healthy

### Abstract

**Aim:** The aim of this study was to measure epicardial adipose tissue (EAT) and to assess left ventricular (LV) systolic and diastolic function in a healthy population grouped according to the presence of fragmented QRS (fQRS).

**Methods:** In this prospective case-control study, the study population consisted of 308 healthy individuals who were divided into two groups according to the existence of fQRS: 180 fQRS(+) individuals (with fQRS), and 128 age- and gender-matched fQRS(-) individuals (without fQRS). These individuals were assessed for EAT thickness and subclinical myocardial dysfunction using transthoracic echocardiography including strain imaging.

**Results:** The baseline clinical characteristics were similar between groups. EAT thickness was significantly increased in fQRS(+) individuals (0.59 vs. 0.44 mm,  $p < 0.001$ ). LV global longitudinal strain, reflecting systolic function ( $19.62 \pm 3.05$  vs.  $20.95 \pm 2.36$ ,  $p < 0.001$ ) and E/A ratio, reflecting diastolic function ( $0.95 \pm 0.30$  vs.  $1.10 \pm 0.37$ ,  $p < 0.001$ ), were decreased, revealing subclinical myocardial dysfunction, in fQRS(+) individuals.

**Conclusions:** The presence of fQRS on the admission ECG is associated with increased EAT and pronounced subclinical LV systolic and diastolic dysfunction in a healthy population. Further studies with larger patient groups are needed to clarify the exact pathophysiological mechanisms underlying these findings in healthy populations.

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**PALAVRAS-CHAVE**

QRS fragmentados;  
Tecido adiposo  
epicárdico;  
Disfunção  
miocárdica;  
Saudável

## A presença de QRS fragmentados está associada ao aumento da espessura do tecido adiposo epicárdico e à disfunção miocárdica subclínica em indivíduos saudáveis

**Resumo**

**Objetivo:** Medir o tecido adiposo epicárdico (EAT) e avaliar as funções sistólica e diastólica do ventrículo esquerdo (VE) numa população saudável segundo a presença de QRS fragmentados (fQRS).

**Métodos:** Neste estudo caso-controle prospetivo participaram 308 indivíduos saudáveis. A amostra foi dividida em dois grupos de acordo com a existência de fQRS; 180 fQRS (+) versus 128 fQRS (-) emparelhados por idade e sexo. Os indivíduos foram avaliados segundo a espessura do EAT e a disfunção miocárdica subclínica por ecocardiografia transtorácica, inclusive imagens de deformação miocárdica (*strain*).

**Resultados:** As características clínicas basais foram semelhantes entre os grupos. A espessura do EAT estava significativamente aumentada nos indivíduos fQRS (+) (0,59 versus 0,44 mm,  $p < 0,001$ ). A deformação longitudinal global do VE que caracterizou a função sistólica ( $19,62 \pm 3,05$  versus  $20,95 \pm 2,36$ ,  $p < 0,001$ ) e a relação E/A, um parâmetro da função diastólica ( $0,95 \pm 0,30$  versus  $1,10 \pm 0,37$ ,  $p < 0,001$ ), estavam diminuídas e traduziram disfunção miocárdica subclínica no grupo de indivíduos fQRS (+).

**Conclusões:** A presença no eletrocardiograma de admissão de QRS fragmentados está associada ao aumento do tecido adiposo epicárdico e à disfunção sistólica e diastólica subclínica do ventrículo esquerdo na população saudável. Para caracterizar os mecanismos fisiopatológicos subjacentes a esses factos numa população saudável são necessários outros estudos com grupos de participantes mais numerosos.

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**Introduction**

Fragmented QRS (fQRS) is a readily available finding on the electrocardiogram (ECG) which can be easily used in clinical practice. It is typically defined as notching in the R or S waves in the absence of bundle branch block or as an additional RSR' pattern in the original QRS wave (with a duration of  $< 120$  ms). fQRS develops as a result of heterogeneous electrical activation caused by disrupted ventricular depolarization. It is an electrocardiographic marker of myocardial fibrosis or scar tissue and has been associated with worse prognosis.<sup>1,2</sup> Additionally, fQRS has been associated with increased sudden cardiac death in patients with idiopathic dilated cardiomyopathy and heart failure.<sup>3,4</sup>

Epicardial adipose tissue (EAT) is the visceral fat depot covering the heart<sup>5</sup> and can be measured with several imaging techniques including echocardiography, cardiac magnetic resonance imaging, or multidetector computed tomography.<sup>6</sup> EAT thickness and volume have been associated with the severity and extent of atherosclerotic coronary artery disease.<sup>7-11</sup> Increased EAT thickness is also strongly associated with increased cardiovascular disease, visceral obesity, subclinical atherosclerosis at multiple locations, and the metabolic syndrome,<sup>12-16</sup> and is a useful parameter in predicting adverse cardiovascular events.<sup>17,18</sup>

Two-dimensional (2D) speckle tracking echocardiography (STE) enables detailed assessment of myocardial function, both systolic and diastolic, and is particularly useful for assessment of subclinical left ventricular (LV) dysfunction

in patients with normal LV ejection fraction (LVEF) on conventional echocardiography.<sup>19,20</sup>

The aim of this study was to measure EAT and to assess LV systolic and diastolic function with STE in a healthy population classified according to the presence of fQRS.

**Methods**

In this prospective case-control study, the initial study population consisted of 185 healthy fQRS(+) individuals (with fQRS) on the ECG from a routine screening examination, and a control group of 128 healthy age- and gender-matched fQRS(-) individuals (without fQRS). All of the participants were non-smokers and they were not taking any medication for acute or chronic disease. Five participants were excluded due to imaging problems. All of the 308 participants included in the study had normal sinus rhythm on ECG and echocardiographic images were of adequate quality. The study was approved by the local ethics committee and all participants were informed about the study and their consent was obtained. The following characteristics were recorded for each participant: age, gender, body mass index (BMI) and heart rate, and measurements were taken of 12-hour fasting blood glucose, triglycerides, total cholesterol, high-density (HDL) and low-density lipoprotein (LDL) cholesterol, and creatinine. Standard 12-lead ECGs were taken. Imaging studies were performed of all patients to obtain data from conventional echocardiography, tissue Doppler and STE.

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