Rev Port Cardiol. 2017;36(12):919–924

Revista Portuguesa de Cardiologia
Portuguese Journal of Cardiology
www.revportcardiol.org

ORIGINAL ARTICLE

Evaluation of QT dispersion and T-peak to T-end interval in patients with early-stage sarcoidosis

Hacı Ahmet Kasapkara[a], **Ayşegül Şentürk**[b], **Emine Bilen**[c], **Hüseyin Ayhan**[a,*], **Bilge Duran Karaduman**[c], **Zeynep Şeyma Turinay**[a], **Murat Can Güney**[a], **Tahir Durmaz**[a], **Telat Keleş**[a], **Engin Bozkurt**[a]

[a] *Yıldırım Beyazıt University, Faculty of Medicine, Department of Cardiology, Ankara, Turkey*
[b] *Ankara Ataturk Education and Research Hospital, Department of Pulmonary Diseases, Ankara, Turkey*
[c] *Ankara Ataturk Education and Research Hospital, Department of Cardiology, Ankara, Turkey*

Received 20 September 2016; accepted 8 May 2017
Available online 7 December 2017

KEYWORDS
T-peak to T-end interval;
Early-stage sarcoidosis;
QT dispersion;
Electrocardiography

Abstract
Introduction and Aim: Sarcoidosis increases inhomogeneity in ventricular repolarization due to the presence of sarcoid granuloma, which significantly correlates with ventricular fibrillation. Various studies have suggested that the interval from the peak to the end of the electrocardiographic T wave (T-peak to T-end [Tpe] interval) may correspond to the transmural dispersion of repolarization and that increased Tpe interval and Tpe/QT ratio are associated with malignant ventricular arrhythmias. The present study hypothesized that QT and Tpe intervals are significantly prolonged in sarcoidosis patients without apparent cardiac involvement.
Methods: The study population consisted of 54 patients (37 female; mean age 43.4±10.6 years) under follow-up for sarcoidosis and 56 healthy subjects (37 female; mean age 42.4±8.6 years).
Results: There was no statistically significant difference between the groups in maximum QT interval, QT dispersion or corrected QT (QTc) interval, but QTc dispersion and Tpe interval were significantly prolonged in the sarcoidosis group compared to the control group (QTc dispersion 59.9±22.5 and 44.4±23.8, respectively, p=0.001; Tpe interval 79.4±9.3 and 70.7±7.03, respectively, p<0.001). We also found that the Tpe/QT ratio was significantly higher in sarcoidosis patients compared to the control group (0.21±0.02 and 0.18±0.23, respectively, p<0.001).
Conclusion: Our study revealed that QTc dispersion, Tpe and Tpe/QT ratio were greater in sarcoidosis patients compared to the control group. To our knowledge, the present study is

* Corresponding author.
E-mail address: huseyinayhan44@yahoo.com (H. Ayhan).

the first to use Tpe interval analysis in patients without cardiac involvement in sarcoidosis. Tpe interval and Tpe/QT ratio may be promising markers for cardiovascular morbidity and mortality due to ventricular arrhythmias in patients with and without cardiac involvement in sarcoidosis.

PALAVRAS-CHAVE
Intervalo pico-fim da onda T;
Sarcoidose em fase inicial;
Dispersão QT;
Eletrocardiografia

Avaliação da dispersão QT e do intervalo pico-fim da onda T em doentes com sarcoidose na fase inicial

Resumo
Introdução e Objetivo: A sarcoidose aumenta a heterogeneidade na repolarização pelo granuloma sarcoide, aspeto que se correlaciona significativamente com a fibrilhação ventricular. Vários estudos sugeriram que o intervalo do pico ao fim da onda T no eletrocardiograma (Tpe) pode corresponder à dispersão transmural da repolarização e que um intervalo Tpe aumentado e o rácio Tpe/QT poderiam estar associados com o risco de arritmias ventriculares malignas. O presente trabalho coloca como hipótese que os intervalos QT e Tpe possam estar significativamente prolongados nos doentes com sarcoidose sem aparente envolvimento cardíaco.
Métodos: A população do estudo foi constituída por 54 doentes (37 do sexo feminino, média de 43,4±10,6 anos) seguidos por sarcoidose e 56 indivíduos saudáveis (37 do sexo feminino; média de 42,4±8,6 anos).
Resultados: Não se encontraram diferenças significativas entre os dois grupos nos parâmetros intervalo QT máximo, dispersão QT e intervalo QTc. A dispersão do QTc e o intervalo TPE estavam significativamente mais prolongados no grupo de doentes com sarcoidose (dispersão do QTc 59,9±22,5 *versus* 44,4±23,8, p=0,001; Tpe 79,4±9,3 *versus* 70,7±7,03, p<0,001). Foi ainda possível demonstrar que o rácio Tpe/QT era significativamente mais alto nos doentes com sarcoidose em relação ao grupo de controlo (0,21±0,02; 0,18±0,23; p<0,001).
Conclusão: O nosso estudo revela que a dispersão do QTc, o intervalo Tpe e o rácio Tpe/QT são mais altos nos doentes com sarcoidose, quando comparados com um grupo de controlo. No nosso conhecimento, o presente estudo é o primeiro a usar a análise do intervalo Tpe em doentes sem envolvimento cardíaco na sarcoidose. O intervalo Tpe e o rácio Tpe/QT poderão vir a ser marcadores promissores para prever a morbilidade e a mortalidade cardiovascular por arritmias ventriculares em doentes com e sem envolvimento cardíaco da sarcoidose.

Introduction

Sarcoidosis is a chronic multisystem disorder of unknown etiology[1] that is most commonly seen in young and middle-aged adults. It is a worldwide disease, with a prevalence of about 4.7-64 per 100 000.[1] Non-caseating granulomas are the pathological hallmark and are most often associated with pulmonary involvement, but may also involve the heart, liver, peripheral lymph nodes, spleen, skin, eyes, phalangeal bones, parotid glands or other organs and tissues. Recent studies suggest that the disease may be an immunological response to an unidentified antigenic trigger.[2] Given the multisystem nature of the disease, its systemic presentations are myriad. Even the cardiac manifestations of the disease vary widely from patient to patient. Symptomatic cardiac involvement is detected clinically in perhaps 5% of patients with pulmonary or systemic sarcoidosis, although cardiac granulomas are found in as many as 30% at autopsy.[2] Imaging studies have found asymptomatic cardiac involvement in 3.7-54.9% of patients with extracardiac sarcoidosis.[3] In particular, early-stage sarcoidosis has a silent progression in most patients despite the presence of cardiac involvement. Clinicians have come to recognize cardiac sarcoidosis (CS) as an uncommon but potentially fatal condition.[4] The clinical manifestations of CS are dependent on the location, extent, and activity of the disease.[5] The three principal sequelae of CS are conduction abnormalities, ventricular arrhythmias, and heart failure.[3,5]

A potential clinical application of interlead QT difference, termed QT dispersion (QTd), was proposed in 1990 by Day et al.[6] Increased QTd on the surface electrocardiogram (ECG) has been linked to increased heterogeneity of ventricular repolarization, which is implicated in the genesis of ventricular arrhythmias, and has been associated with an adverse prognosis in a variety of patient populations.[7–9] Myocardial repolarization has been assessed by various methods, including QT dispersion, corrected QT dispersion (cQTd), and transmural dispersion of