

## Electrical storm: An unusual manifestation of coronary ectasia

### *Tormenta eléctrica: una manifestación inusual de ectasia coronaria*

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### Introduction

Coronary ectasia (CE) is a diffuse disease of the vessel that causes a dilation larger than 1.5 times in comparison with an adjacent segment of a healthy artery. CE incidence ranges from 0.3 to 4.9% in the general population<sup>1</sup>. Despite its relative frequency, CE clinical presentation, origin, management, and prevention continue to be a subject of debate and continuous medical research<sup>2</sup>. We report the case of a CE uncommon presentation: electric storm.

### Clinical case

A 42-year-old man with a history of long-standing type 2 diabetes mellitus with intense tobacco consumption for 20 years. He attended the emergency department of our hospital with a 24-h history of oppressive chest pain radiating to the left shoulder and associated with dyspnea. On physical examination, vital signs stood out: HR 84 bpm, BP 106/70 mmHg, RR 22 brpm, and 86% SpO<sub>2</sub>, as well as the presence of subcrackling rales in both lung bases. Precordium with rhythmic heart sounds, no murmurs or other anomalies. Admission electrocardiogram on sinus rhythm, with a lower inactivable zone (QS). During emergency department examination, profuse diaphoresis occurred suddenly, and ventricular tachycardia (VT) was documented (Fig. 1); the patient was hemodynamically stable. The treatment was started with amiodarone, without the

condition being resolved; due to the persistence of symptoms, electrical cardioversion was carried out on three occasions, unsuccessfully. Intravenous (i.v.) lidocaine was administered, whereby sinus rhythm was obtained for 30 s, to again return to VT. Orotracheal intubation was decided, and the patient was brought to diagnostic coronary angiography, which reported CE in all three main arteries, with significant thrombotic load (TIMI IV thrombus in the right coronary artery and TIMI IV thrombus in the circumflex branch), as well as TIMI II slow flow (Fig. 2). A tirofiban intracoronary dose was administered, as well as *in situ* thrombolysis with intra-coronary tenecteplase in the right coronary artery (responsible for the infarction). Intra-aortic counterpulsation balloon was placed due to VT persistence and, still in the operation room, electrical cardioversion was performed for the 4<sup>th</sup> time, with sinus rhythm and hemodynamic state improvement being obtained. The patient was transferred to the coronary unit, where he showed improvement during the next few hours.

### Discussion

In 1761, Morgagni<sup>3</sup> first described CE anatomical characteristics in a patient with syphilis, but the term ectasia (from Latin *ectasis*, dilation) was coined by Bjork in 1966. In more than half the cases, CE is associated with atherosclerotic coronary artery disease, but on less frequent occasions, it has been related to

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Date of reception: 11-12-2018

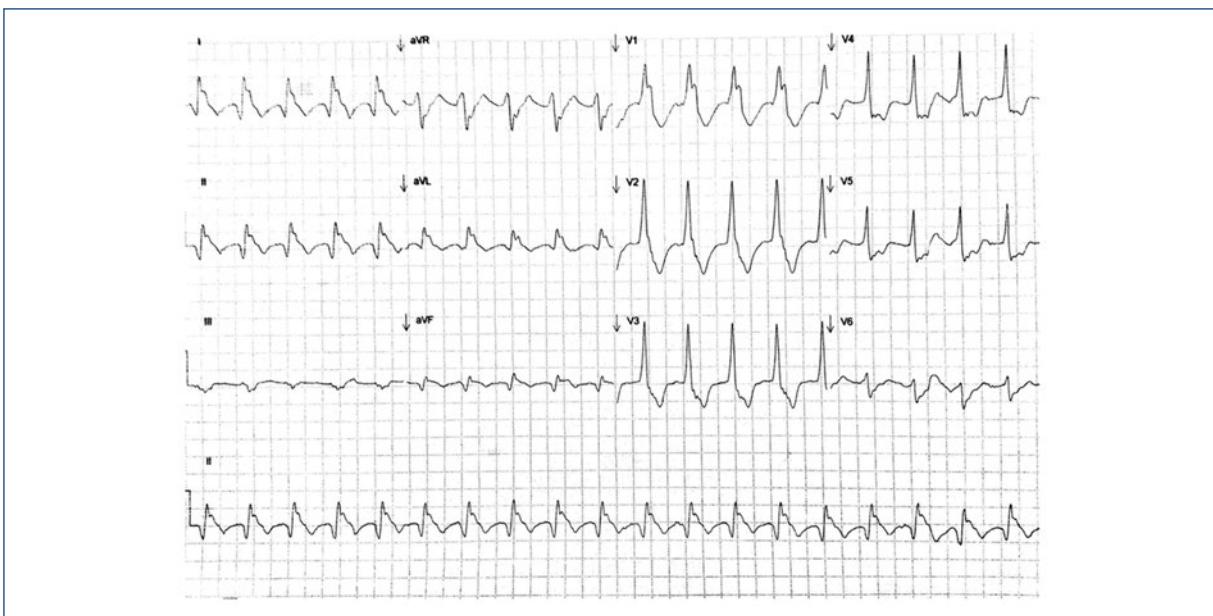
Date of acceptance: 13-08-2019

DOI: 10.24875/ACME.M20000116

Available online: 04-09-2020

Arch Cardiol Mex (Eng). 2020;90(2):207-209

[www.archivoscardiologia.com](http://www.archivoscardiologia.com)



**Figure 1.** ECG shows wide-complex, monomorphic tachycardia with the left horizontal axis and RBBB morphology, suggesting that ventricular tachycardia site of origin may have been the interventricular septum left side basal segments.



**Figure 2.** Coronarography with the presence of ectatic arteries.

other pathological conditions such as exposure to herbicides, Takayasu disease, polyarteritis nodosa, trauma, or direct vascular injury.<sup>5</sup> All three coronary arteries can be affected by CE, but in 75% of patients, it is an isolated artery that is ectatic<sup>5</sup>. Markis et al. proposed a form to classify CE according to the degree of severity of the condition. In decreasing order of severity: diffuse ectasia of two or three vessels (type I), a diffuse disease in one vessel and localized disease in another vessel (type II), and diffuse ectasia in one vessel (type III) and localized segmental ectasia (type IV)<sup>4</sup>. As for the clinical presentation of these patients, stable chronic angina tends to be the most common<sup>7</sup>. Acute coronary syndromes, both with and without ST-segment

elevation, can occur due to blood flow alteration secondary to distal embolization or thrombotic occlusion of an ectatic segment<sup>8,9</sup>.

In this case, given that presentation was as wide-complex tachycardia, the correct diagnosis of the tachycardia origin is essential for decision making, and there are algorithms that suggest how to enable making a differentiation between supraventricular tachycardia and VT, using both Brugada and Verckei diagnostic criteria<sup>10,11</sup>. The patient electrocardiogram showed an initial R-wave in the aVR lead, as well as that its width was longer than 40 ms, thus meeting two Verckei criteria to be classified as VT. On the other hand, although according to Brugada criteria, there was no absence of RS in all precordial leads, R-to-S time was shorter than 100 ms, there is no V-A dissociation, it met other morphological criteria for VT in V1 and V6 in the presence right bundle branch block.

The term “electrical storm” describes a state of heart electrical instability characterized by a grouping of VT or ventricular fibrillation (VF) recurrent episodes in a short period of time. In recent years, implantation of an automated implantable cardioverter-defibrillator (AICD) has significantly improved the survival of patients with VT/VF. However, electrical storms are associated with high mortality and morbidity and have a negative impact on long-term clinical outcomes<sup>15</sup>. Although there

is no consensus on the definition of an electrical storm, it is generally accepted that the appearance of > 2 VT separate episodes/or > 2 VF episodes or > 3 appropriate AICD therapies for VT/VF in a 24-h period constitute an electrical storm episode.

CE has been associated with a secondary slow coronary flow phenomenon, characterized by a distal delay in coronary vessel opacification in the absence of significant epicardial coronary artery stenosis<sup>6</sup>. The pathogenic mechanism is not fully understood. Clinically, this phenomenon occurs in young men and smokers who are admitted as having acute coronary syndrome<sup>7</sup>, and it has been associated with malignant arrhythmias and sudden cardiac death<sup>12-14</sup>.

We consider that the coronary slow flow phenomenon played a pivotal role in the pathophysiology of the electrical storm in the described case. There is much that remains to be elucidated about the interrelation existing between CE, coronary flow dynamics, and arrhythmic load in the context of the ischemic coronary syndrome. To the best of our knowledge, this is the first case that reports a direct association of CE and electrical storm.

## Funding

None.

## Conflicts of interest

None.

## Ethical responsibilities

**Protection of people and animals.** The authors declare that no experiments were performed on humans or animals for this investigation.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of the patient data.

**Right to privacy and informed consent.** The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in possession of the corresponding author.

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