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Case Report

Cardiocentro ERNESTO CHE GUEVARA SANTA CLARA CUBA

"De Winter" pattern in patients with non-ST-segment elevation acute coronary syndrome

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Abbreviations
LAD: left anterior descending artery
AMI: acute myocardial infarction

ABSTRACT
"De Winter" pattern was first described by Robbert J. de Winter in 2008. It is an electrocardiographic sign characterized by ST-segment depression of 1-3 mm, in precordial leads (V_1-V_4), with a high and symmetrical T wave in the same leads, associated with ST-segment elevation in aVR, which represents a severe lesion of the proximal left anterior descending artery. The case report presented corresponds to 22-year-old man who came to the emergency department with the mentioned electrocardiographic changes; in the coronary angiography is confirmed the presence of a severe, occlusive lesion (100%), of ostial location, in the left anterior descending artery, on which a percutaneous transluminal coronary angioplasty was successfully performed.
Keywords: Electrocardiography, Acute coronary syndrome, Myocardial infarction, de Winter ECG pattern

Patrón de «de Winter» en paciente con síndrome coronario agudo sin elevación del segmento ST

RESUMEN
El patrón de «de Winter» fue descrito por Robbert J. de Winter en 2008. Es un signo electrocardiográfico caracterizado por infradesnivel del segmento ST de 1-3 mm, en derivaciones precordiales (V_1-V_4), con una onda T alta y simétrica en las mismas derivaciones, asociado con supradesnivel del segmento ST en aVR, lo que se corresponde con una lesión grave de la arteria descendente anterior de localización proximal. Se presenta el caso clínico de un hombre de 22 años de edad que acudió a urgencias con las alteraciones electrocardiográficas descritas, y en la coronariografia se corroboró la presencia de una lesión grave, oclusiva (100%), de localización ostial, en la arteria descendente anterior, sobre la que se realizó angioplastia coronaria transluminal percutánea satisfactoriamente.
Palabras clave: Electrocardiograma, Síndrome coronario agudo, Infarto de miocardio, Patrón de «de Winter»

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INTRODUCTION

Chest pain is a frequent complaint in the emergency departments worldwide, approximately 25% of them are caused by an acute coronary syndrome[1,2]. Many of these patients have personal pathological history of high blood pressure, diabetes mellitus, dyslipidemia and obesity; also, toxic habits such as smoking, and an age over 65 years. Its presentation, as well as the possible complications and mortality, are directly related with these risk factors[3]; however, nowadays, it is more frequent that people under 30 years of age, with none or few risk factors, suffer from an acute myocardial infarction (AMI).

In the diagnosis of the acute coronary syndrome, the 12-lead electrocardiogram is an essential tool because it provides important information for early diagnosis; nonetheless, despite the constant updates that develop in our time regarding the precise diagnosis of this syndrome, a group of patients is not included in these definitions[4].

In 2008, Robbert J. de Winter described an electrocardiographic sign which corresponds with a severe lesion of the proximal left anterior descending (LAD) artery. After studying a series of 1532 patients with anterior wall AMI, he found that 2% had a non-ST-segment elevation electrocardiographic pattern, which coincided with the previously described lesion of the LAD[5].

The sign was described as a ST-segment depression of 1-3 mm in precordial leads (V_1-V_4) with a high and symmetrical T wave, in the same leads, associated with a ST-segment elevation in aVR of 0.5 mm[6]. This change was attributed, from the physiological point of view, to variations of conduction in Pur-kinje fibers, with delayed interventricular conduction and to alterations in the ATP-sensitive potassium channel (K_{ATP}), with myocardial ischemia in the septum area, thus, in the electrocardiogram, prominent T waves appeared with J point depression.

Other authors[7] suggest that it is caused by a delay in the conduction of the subendocardial area with a change in the form of the depression action potential (slow and long-lasting ascent). The sum of this small change with the transmembrane action potential of the subepicardium explains the J point depression and the high T wave of the electrocardiographic tracing.

CASE REPORT

The following is the case of a 22-year-old man, with a history of apparent health, smoker of more than one pack of cigarettes a day since over 5 years, who came to the emergency department of his health area's polyclinic due to retrosternal, oppressive pain and received medical treatment with sublingual nitroglycerin, with no relief. An electrocardiogram was performed and he was referred to the Hospital Manuel Fajardo.

In the first electrocardiogram, a drop in the J point in precordial leads (V_2-V_5) and hyperacute T waves (**Figure 1**) were observed. Then, he was admitted at the Intensive Care Unit, with electrocardiographic monitoring and started of anticoagulant therapy accordingly with the non-ST-segment elevation acute coronary syndrome.

Rhythmic cardiac noises, without presence of murmurs or third heart sound, were confirmed in the physical examination, as well as a heart rate of 88 beats per minute and blood pressure of 130/75 mmHg. In the laboratory tests performed, the available cardiac enzymes were within normal limits (CK-MB 13 UI).

The echocardiogram showed a left ventricle's diastolic diameter of 59 mm, and systolic of 39 mm, with ejection fraction by Teichholz and Simpson of 51% and 43.5%, respectively, and fractional shortening of 26%. Furthermore, hypokinesia of the anteromedial and apical segments of the interventricular septum, with compensating mobility of the postero-inferior wall; hypokinesia of the anteroseptal medial and apical wall, and hypokinesia of the anterior mid-apical wall, as well as decreased apex closure.

The next day, after his transfer to the Intensive Coronary Care Unit of the Hospital Manuel Fajardo, an invasive coronary angiography was performed at the *Instituto de Cardiología y Cirugía Cardiovascular*, with the following results: Severe lesion of ostial location in LAD (100%), with distal flow TIMI 0 (**Figure 2A**). Rest of epicardial coronary arteries without significant angiographic lesions.

A percutaneous transluminal coronary angioplasty was the decided procedure, which was performed successfully (**Figure 2B**) and the patient progressed favorably.

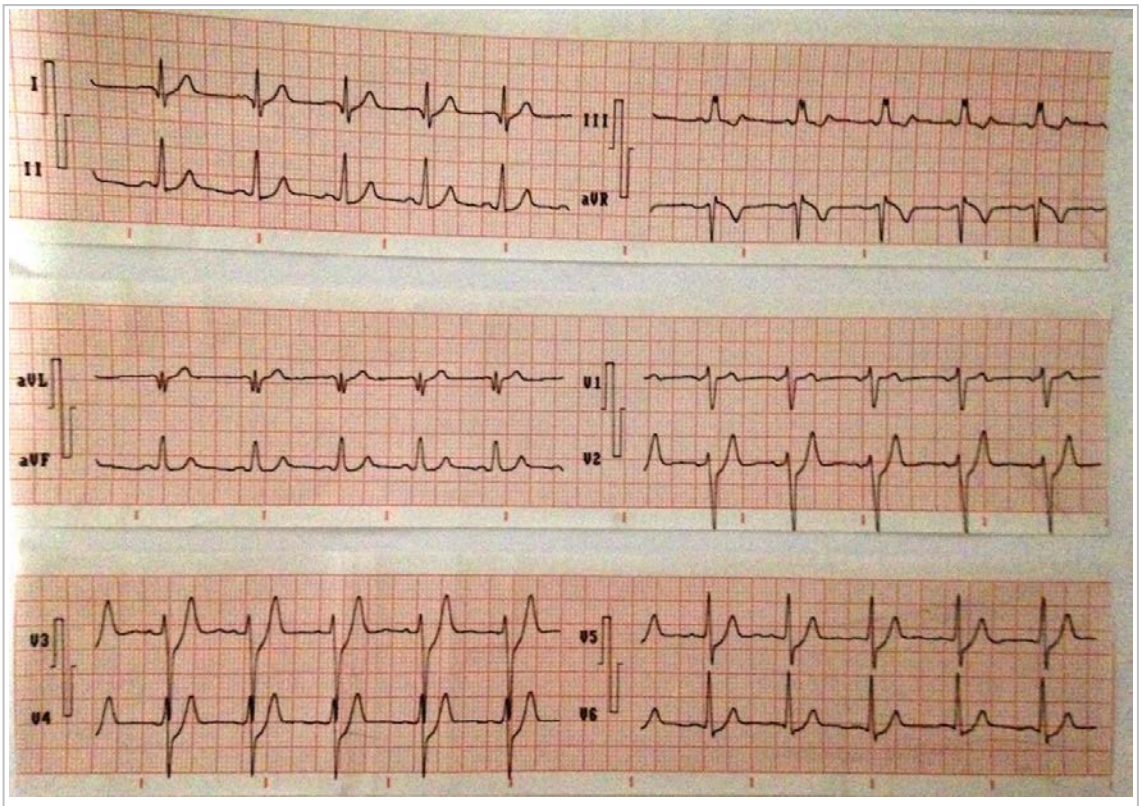

Figure 1. Twelve-lead electrocardiogram where an elevation of J point in precordial leads (V_2-V_5) with hyperacute T waves is observed, which corresponds to the "de Winter" patter.

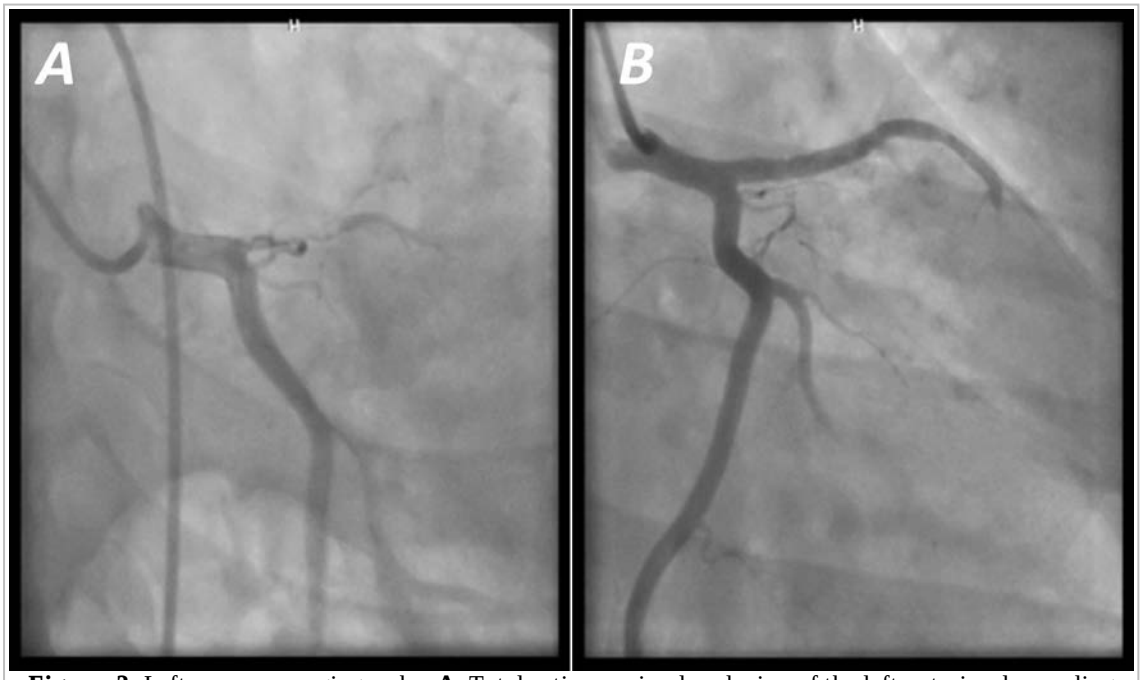

Figure 2. Left coronary angiography. **A.** Total ostio-proximal occlusion of the left anterior descending artery is observed (anteroposterior view with caudal inclination). **B.** Right anterior oblique view with caudal inclination, after angioplasty.

COMMENTS

The electrocardiographic pattern presented in this case represents the occlusion/sub-occlusion of the proximal LAD described by "de Winter". The patient's age and atypical electrocardiographic presentation stand out in the case report. Nowadays, a more updated electrocardiography knowledge is needed, which can allow identifying this high-risk pattern in order to detect obstructive lesions that would benefit from an early invasive strategy.

According to "de Winter" himself, and his associates[5], the pattern that bears his name is present in 2% of severe occlusions of the LAD, and some describe it more frequently in males, at earlier ages, and associated with dyslipidemias[8,9]. This pattern has a high positive predictive value of 92.5% for acute coronary occlusions of the LAD[10]. Verouden *et al*[11] reported that approximately 50% of patients with "de Winter" pattern present a severe lesion of the LAD, associated with large areas of myocardial ischemia.

Although it is not included in the electrocardiographic variants of the AMI in recent definitions of the ST-segment elevation acute coronary syndrome, in the ones where the new-onset left bundle branch block and the posterior infarction are included, these patients require an early invasive strategy for high risk of progressing to acute myocardial infarction of large area. On the other hand, the usefulness of echocardiography is reaffirmed, as another tool, in case of doubt to decide a revascularization strategy.

CONCLUSIONS

Although the "de Winter" pattern implies an atypical electrocardiographic manifestation, it carries an important prognostic implication; nevertheless, in the current definitions of the non-ST-segment elevation acute coronary syndrome is not registered this pattern as very high risk angina that could evolve –if not properly treated– to an ST-segment elevation myocardial infarction, and even the patient's death.

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