

## Infrequent electrocardiographic pattern of complete left anterior descending artery occlusion: The "de Winter" pattern apropos of a case

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### ARTICLE INFORMATION

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### Competing interests

The authors declare no competing interests

### Abbreviations

LAD: left anterior descending artery

### ABSTRACT

Accurate diagnosis through the electrocardiogram (ECG) is crucial when it comes to establishing certain behavior in the presence of an acute coronary syndrome. A brief review of the literature was carried out apropos of a case of de Winter ECG pattern which is an infrequent electrocardiographic pattern of complete left anterior descending artery occlusion that, if overlooked, causes the procedures required in each case to be unnecessarily delayed. Its electrocardiographic course and subsequent follow-up are presented so as not to forget that the electrocardiogram continues to be an invaluable and powerful tool in modern cardiology.

**Keywords:** Electrocardiography, Acute coronary syndrome, Myocardial infarction, de Winter ECG pattern

### *Evolución electrocardiográfica infrecuente de la oclusión total de la arteria descendente anterior: Patrón de «de Winter» a propósito de un caso*

### RESUMEN

*El diagnóstico acertado a través del electrocardiograma es invaluable a la hora de establecer la conducta ante un síndrome coronario agudo. Se hace una breve revisión de la literatura, a propósito de un caso con patrón de «de Winter», el cual constituye un patrón electrocardiográfico infrecuente de oclusión total de la arteria descendente anterior y que provoca, al desconocerlo, una demora en la realización del procedimiento necesario en cada caso. Se presenta su evolución electrocardiográfica y el seguimiento posterior, con el objeto de no obviar la importante herramienta que continua siendo el electrocardiograma en la cardiología moderna.*

**Palabras clave:** Electrocardiograma, Síndrome coronario agudo, Infarto de miocardio, Patrón de «de Winter»

### INTRODUCTION

The electrocardiogram, a tool from the beginning of the last century, has remained steadfast and irreplaceable in an increasingly technified world. This age-old technology is still able to show its low-cost benefits, easy ac-

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cessibility and promptness in diagnoses requiring fast and sometimes invasive procedures aimed at saving and also improving the life of the patient suffering from a cardiovascular event. In the first decade of 1900 –although not published until 1912– Einthoven managed to foresee the great potential of the electrocardiogram<sup>1</sup>, when he published corrected records that, morphologically, do not differ from the current ones. Shortly thereafter, in 1912 Herrick<sup>2</sup> published the first case of acute myocardial infarction and its characteristic electrocardiogram.

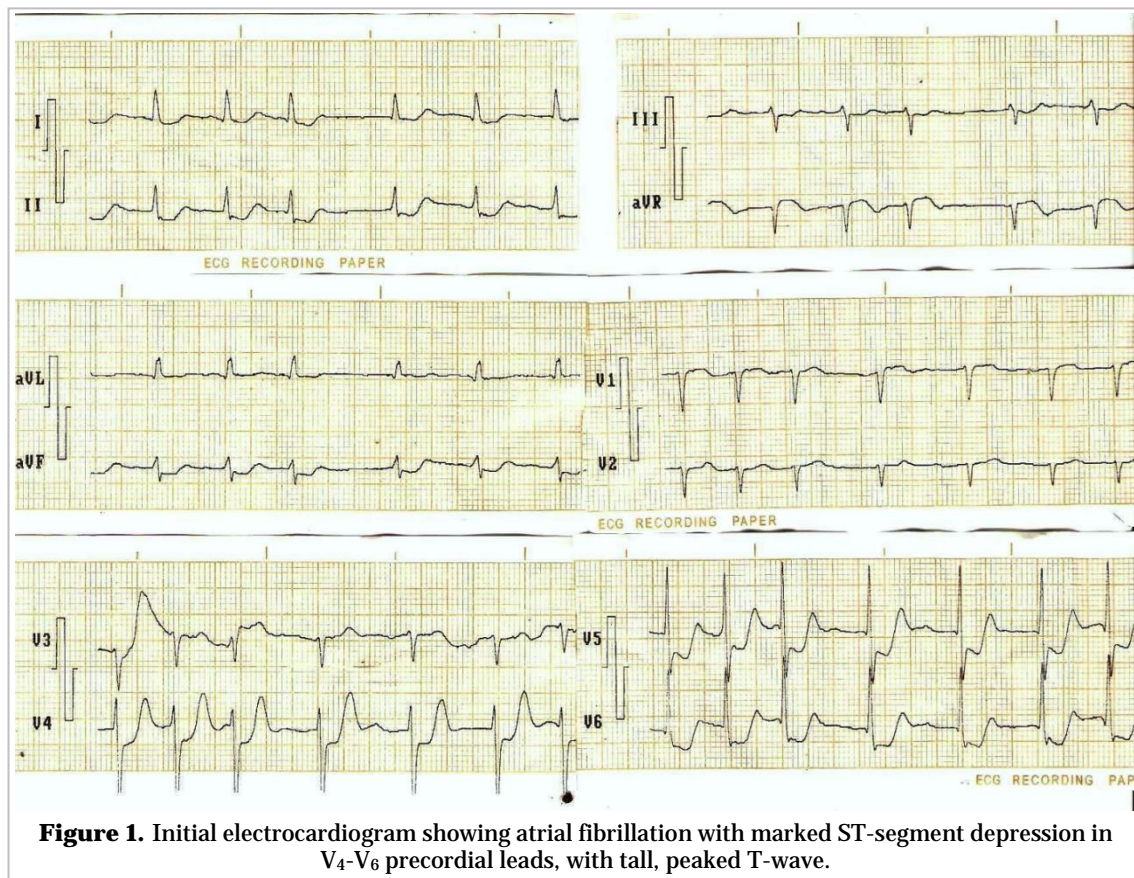
Hence the undeniable importance of early diagnosis of ST-segment elevation acute coronary syndrome, since especially in this case, the phrase “time is muscle”, is quite right and every doctor truly wants to detect it as early as possible. For this reason, the electrocardiographic manifestations of these patients continue to be a thoroughly researched subject, since every lost minute will undoubtedly affect their subsequent outcome.

Among the non-classical electrocardiographic morphologies of the myocardial infarction due to complete left anterior descending (LAD) artery oc-

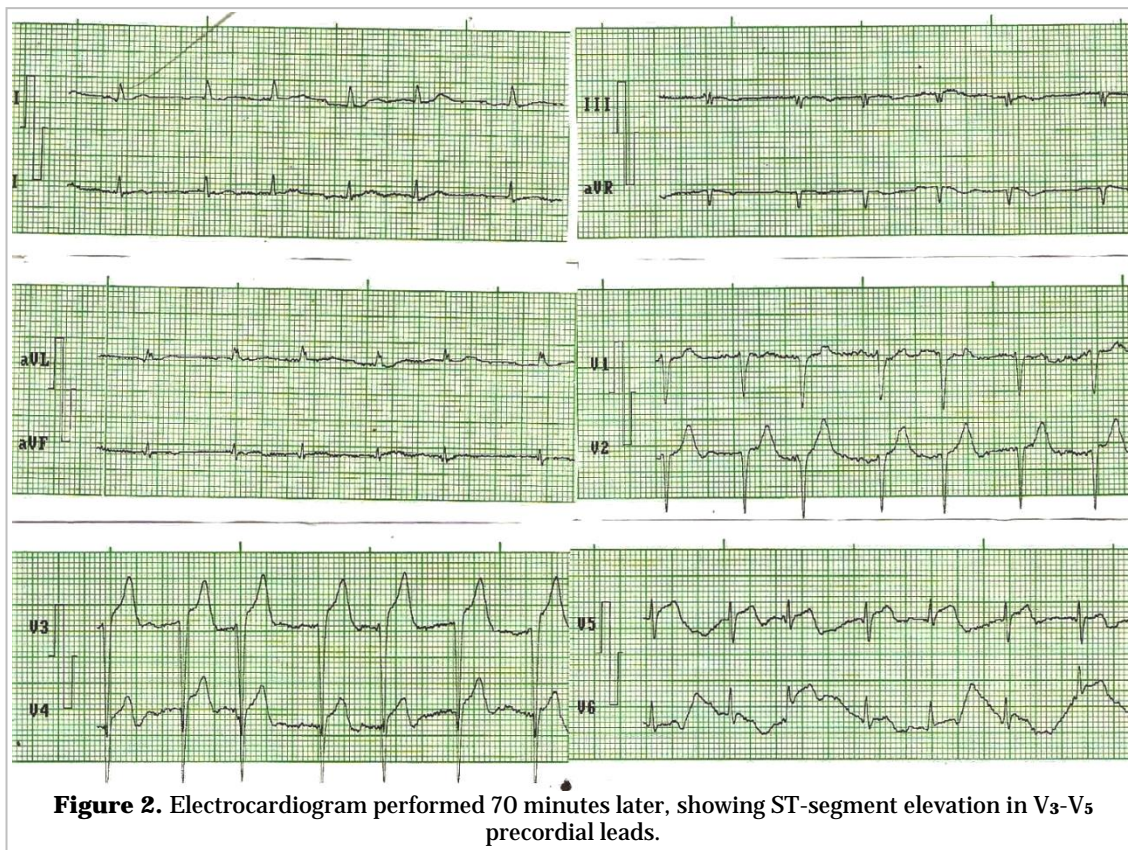
clusion, a rare pattern is found, although not less important –since missing it implies a gloomy prognosis for the patient suffering from it– the so-called “de Winter” ECG pattern<sup>3</sup>. Described by this author<sup>3</sup> in 2008, this pattern is manifested by the presence of peaked, tall, symmetrical T-waves accompanied by upsloping ST-segment depression in the precordial leads (V<sub>2</sub>-V<sub>4</sub>), associated with proximal LAD artery occlusion. We present the case of a patient with this electrocardiographic pattern, whose course was favorable thanks to accurate diagnosis and early establishment of treatment.

### CASE REPORT

The case of a white 72-year-old woman with a long history of both arterial hypertension and type II diabetes mellitus is described herein. She self-presented to her health care area complaining of several days of oppressive chest pain that was relieved by rest. However, on this occasion the pain worsened and was accompanied by a weird dying sensation



**Figure 1.** Initial electrocardiogram showing atrial fibrillation with marked ST-segment depression in V<sub>4</sub>-V<sub>6</sub> precordial leads, with tall, peaked T-wave.



and profuse sweating. She relieved after opioids administration and was urgently referred to our center where she was admitted to the critical care unit with initial diagnosis of non ST-segment elevation acute myocardial infarction versus unstable angina with electrical instability.

However, the initial electrocardiogram (**Figure 1**) showed atrial fibrillation and markedly ST-segment depression in the left precordial leads (V<sub>4</sub>-V<sub>6</sub>), with tall, peaked anterior T-waves both suggestive of the “de Winter” ECG pattern previously described. Due to the well-known delayed patient transfers and because we considered that she might take more than three hours between the onset of symptoms and arrival at the Interventional Cardiology Unit, we decided to start thrombolysis. The electrocardiogram—performed 70 minutes after her arrival at the hospital and before administration of recombinant streptokinase—already showed precordial ST-segment elevation in leads V<sub>3</sub>-V<sub>5</sub> (**Figure 2**).

The patient was subsequently transferred to the “Cardiocentro” in Santa Clara where she underwent facilitated angioplasty. The LAD artery was proved to be the infarct-related artery; hence, it was suc-

cessfully managed by implantation of a drug-eluting stent. She made a satisfactory postoperative recovery.

The case is a good reminder that the knowledge of these non-classical electrocardiographic patterns of non-ST-segment elevation infarction, although transmural, is critical for our professionals in order to have a more efficient performance for the benefit of each patient.

## COMMENTS

The presence of tall, symmetrical T-waves, occasionally accompanied by small ST segment elevation, sometimes persisting for hours, were described by Sagie *et al*<sup>4</sup> as an electrocardiographic sign of acute transmural myocardial infarction, although in a selected group of patients no ST-segment elevation appeared. Birnbaum *et al*<sup>5</sup> considered these alterations as a grade I myocardial ischemia, generally in patients with artery occlusion and good collateral flow, so they attributed them a low risk of in-hospital mortality. Later, however, Robbert J. de Winter *et al*<sup>3</sup>

published a series on this subject in 2008. They associated these shifts to an acute proximal left anterior descending occlusion, which led to the need to accordingly manage these patients. The resulting pattern has been referred to as de Winter<sup>3</sup> in a number of current publications, although some authors consider<sup>6</sup> –and not without reason– that the pattern in question precedes that found in Wellens syndrome, with differences in the time of onset, considering it to be part of the same phenomenon.

In contrast, Gorgels<sup>7</sup> associated the aforementioned electrocardiographic pattern with the presence of certain collateral circulation or ischemic preconditioning, or both, which has not been demonstrated in the series presented, since in the “de Winter” ECG pattern series no significant presence of collateral vessels was found. With respect to preconditioning, such series did not take into account the history of the presence or not of pre-infarction angina, which was indeed present in our patient and could be suggestive of such a mechanism in that case.

Perhaps the Fiol Sala *et al*<sup>8</sup> group has the most logical explanation of the phenomenon; they explain that there is a delayed subendocardial repolarization with changes in the transmembrane action potential shape (slow, long-term ascent). The sum of this small alteration together with the subepicardial transmembrane action potential could explain both J-point depression combined with tall, symmetrical T-waves in the electrocardiographic tracing<sup>8</sup>; although this theory moves a little away from the series initially described by “de Winter”, since the occlusion would be incomplete in the first moments and patients usually arrive at the hemodynamics laboratory showing the same electrocardiographic pattern and TIMI grade 0 or 1 flow<sup>9</sup>. In their cases, a fast-acting procedure is performed; something that does not occur in ours and this may be the reason why we observed the presence of ST-segment elevation shortly before the intervention, something that the Fiol Sala *et al*<sup>8</sup> group did predict as likely in the case of delay in patient treatment.

Knowledge of this electrocardiographic pattern is of utmost importance, since improper management could lead to extensive infarctions with the conse-

quent associated complications, as described by Dressler and Roesler in a case published in 1947<sup>10</sup>.

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