

An unusual combination of electrocardiographic alterations in a young woman with a near syncope

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Clinical vignette

A 31-year-old female patient, smoker and with dyslipidaemia, with no other cardiovascular risk factors or family history of interest, came to the emergency department for an episode of dizziness with blurred vision, while at rest. She denied having symptoms related to exertion and did not consume toxic substances or drugs. The physical examination in the emergency department was normal, with no heart murmurs. Basic laboratory tests were also normal, including serum electrolytes and high-sensitivity troponins. The electrocardiogram (ECG; *Figure 1A*) showed sinus rhythm at 60 b.p.m., normal QRS, and a marked alteration of the ST segment and T wave (very wide and sharp T waves, positive in I and aVL, and negative in III and aVF) and a long QT (cQT 469 ms). A transthoracic echocardiogram was performed in the emergency department, being completely normal, with a left-ventricular ejection fraction of 66%. The cardiologist was notified and, after reviewing all the tests and the clinical history, indicated that a procedure should be performed. Once the procedure is performed, the ECG was repeated and the previous abnormalities have disappeared (*Figure 1B*).

Questions

Question 1: What is the most likely diagnosis based on this patient's medical history and the electrocardiographic abnormalities on the initial electrocardiogram?

- (1) Absence of cardiac disease. Probably an artefact.
- (2) Acute coronary syndrome with thrombotic involvement of the circumflex artery in a female patient who smokes.
- (3) Congenital long QT syndrome resulting in ventricular tachycardia as a cause of presyncope.
- (4) Long QT in possible relation to the intake of a psychotropic drug, although the patient denies it.
- (5) Acute coronary syndrome with long QT secondary to ischaemia.

Question 2: What is the procedure indicated by the cardiologist that led to normalization of the electrocardiographic alterations after its performance?

- (1) Urgent coronary angiography and stent revascularization of a thrombotic obstruction of a proximal lesion of the circumflex artery.
- (2) Determination of serum magnesium levels and intravenous magnesium infusion.
- (3) Repeat ECG after changing the leads of the left arm and leg leads.
- (4) Repeat ECG after changing the position of the left-arm electrode.
- (5) Administration of sublingual nitroglycerin.

Question 3: What was the key factor that led the cardiologist to make the suspected diagnosis and indicate the procedure performed?

- (1) The duration of the cQT, <500 ms.
- (2) The very abnormal T-wave morphology in a patient without chest pain.
- (3) The normality of the T wave and QT in Lead II.
- (4) Suspicion of vasospastic angina.
- (5) The previous low cardiovascular risk profile of the patient.

Comments to the questions and answers

The initial ECG (*Figure 1A*) shows a very striking alteration of repolarization, with a very wide and anomalous T wave and QT that is very long, but only in four leads (I, aVL, III, and aVF), being normal in precordial leads, aVR and II. This rules out long QT of any origin, as it should be prolonged in all 12 leads. Acute ischaemic involvement cannot be ruled out, although the morphology of the T wave is not suggestive of this, and the

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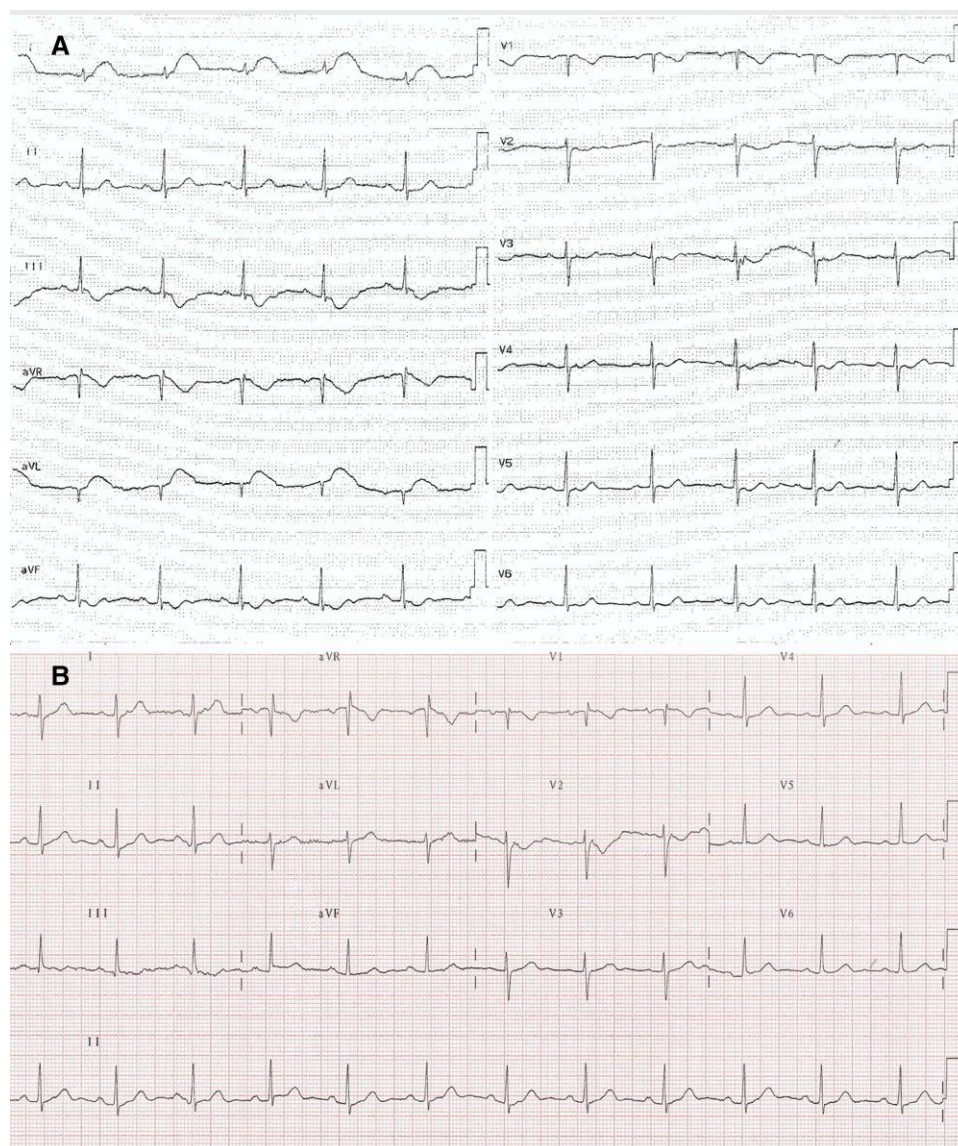


Figure 1 Electrocardiogram at baseline (A) and after the procedure indicated by the cardiologist (B).

profile of a 31-year-old woman is low risk, despite smoking. Everything points to an electrocardiographic artefact (Question 1, Answer 1).

The procedure indicated by the cardiologist was to change the position of the electrode in the left-arm lead, given the normal ST-T in II, which pointed to a specific artefact, known as electromechanical association⁽¹⁻³⁾ (Question 2, Answer 4).

The key point that led the cardiologist to the correct diagnosis was the normality of the II derivation, which indicated that the problem was related to the left-arm electrode (Question 3, Answer 3).

This little-known electrocardiographic artefact is due to the placement of an electrode in the area of an arterial pulse or cardiac apex impulse. In the case presented, it is the intermittent contact of the electrode on the left arm with the skin during the pulsatile movement of the radial artery that causes the distortion of the T wave and the QT interval in the leads using this electrode. These artefacts are more difficult to identify than the more common ones of non-cardiac origin, and can lead, if not correctly diagnosed, to erroneous and unnecessary clinical decisions, such as an urgent coronary angiography or an electrophysiological study.

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Consent: The authors confirm that consent for submission and publication of this case, including images and associated text, has been obtained from the patient, in the European Heart Journal Case Reports format, and is available for review by the Editor-in Chief of the Journal.

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