

Drug abuse, hypothermia, or acute myocardial infarction?

Gianluca Rigatelli ^{1*}, Giovanni De Santis², and Marco Zuin ³

¹Cardiovascular Diagnosis and Endoluminal Interventions, Aulss5, Rovigo, Italy; ²Division of Anaesthesiology, Intensive Care Unit, Aulss5, Rovigo, Italy; and ³Department of Translational Internal Medicine, Ferrara University Medical School, Ferrara, Italy

Received 20 May 2021; first decision 3 June 2021; accepted 22 July 2021; online publish-ahead-of-print 24 September 2021

Clinical vignette

A 30-year-old smoker and depressive man was found lethargic and unresponsive at the work place. A shock status and a severe hypothermia (33°C) were apparent at intensive care unit admission. Biomarkers were remarkable only for a high level of cannabinoids and a slight increase of ultrasensitive troponin without dynamic changes at serial controls. Brain computed tomography was normal. Electrocardiogram (Figure 1) revealed an abnormal J Wave and an ST elevation on anterolateral leads. Echocardiogram revealed an apparent diffuse hypokinesia more pronounced on anterior wall. To clear the suspect of an acute coronary syndrome, a radial access coronary angiography was performed: normal coronary arteries but a diffuse severely depressed left ventricular function (ejection fraction 27%) were apparent. Electrocardiogram turn normal within 24 h after warming treatments and cannabinoid antagonist administration (Supplementary material online, Figure S1). Patient was discharged after 4 days: echocardiogram at discharge demonstrated an almost complete recovery of the left ventricular function.

Questions

- What does the J Wave in the QRS complex refer to?
 - Signs of acute myocarditis
 - Alteration of ionic state
 - Combination of sign of acute coronary spasm and bioumoral abnormalities
 - Secondary signs of lethargia
 - Osborn wave

The correct answer is (E). Hypothermia can induce changes in the cardiac action potential related to abnormal I_{to} current which are usually expressed with characteristic electrocardiography (ECG) changes, such as slowed impulse conduction through potassium channels, and

prolongation of ECG intervals, including RR, PR, QRS, and QT. Ventricular fibrillation, bradycardia, atrial fibrillation and flutter may be seen with the characteristic J wave, or Osborn wave, also known as a late delta wave or camel-hump wave.¹ The first time a J wave was described in detail was by John J. Osborn in 1953,² and they have since then been referred to as Osborn waves. Cannabis and its synthetic derivatives have cardiovascular side effects, including potential myocardial infarction (MI), postural hypotension, and bradycardia. Cannabinoid abuse can induce severe long-lasting hypothermia, MI-mimicking electrocardiogram, and severe left ventricular dysfunction.

- Was the ST-segment abnormalities typical for acute coronary syndrome?
 - Not at all
 - Yes, absolutely
 - No, following the Universal definition of myocardial infarction,³ an ST elevation <2.5 mm in V2–V3 has a low specificity in young males
 - Yes, sometimes the ST elevation was not the classical Pardee wave

The correct answer is (C). The effects of hypothermia and cannabinoids may cause not only an Osborn wave but also an anterolateral ST elevation, and this may mimic ST-segment elevation MI.⁴

- Was the clinical management correct?
 - No, patient should not be submitted to coronary angiography
 - Not completely, coronary angiography should be deferred until warming process was completed
 - Yes, recent European guidelines of NSTEMI identified cardiogenic shock as class I indication for coronary angiography⁵
 - Not at all, coronary vasculature should be checked by computed tomography
 - Yes, completely justified on the basis of electrocardiogram and echocardiography findings

The correct answer is (C). In the presented case, the suspicion of acute coronary syndrome was also the abnormal ST elevation in the anterior leads and the diffuse hypokinesia and the history of severe

* Corresponding author. Tel: +39 0425394509, Fax: +39 0425394513, Email: jackyheart@libero.it

Handling Editor: Stefano Bordignon

© The Author(s) 2021. Published by Oxford University Press on behalf of the European Society of Cardiology.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com

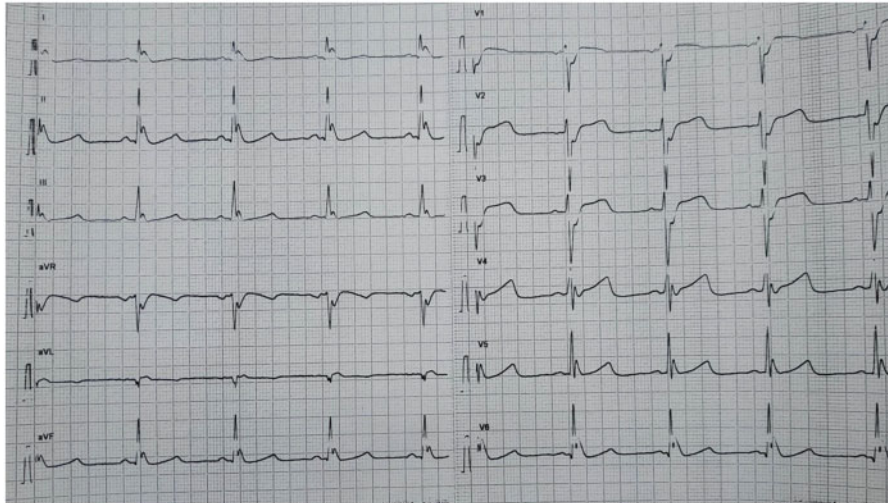


Figure 1 Electrocardiogram on admission: note the incisure in the QRS complex and the unusual ST elevation on anterolateral leads.

smoking and depressive habitus. The radial access ensured a quick coronary check with small contrast medium volume and no complications. Nevertheless, hypothermia should be addressed immediately in a case of ST elevation with an Osborn wave following suspected cannabinoid use. External rewarming might reverse ECG changes and be beneficial for the poor haemodynamic condition and rhythm abnormalities preventing misinterpretation of ECG results as ischaemic.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

Funding: None declared.

References

1. Casier I, Vanduyhoven P, Haine S, Vrints C, Jorens PG. Is recent cannabis use associated with acute coronary syndromes? An illustrative case series. *Acta Cardiol* 2014;**69**:131–136.
2. Osborn JJ. Experimental hypothermia; respiratory and blood pH changes in relation to cardiac function. *Am J Physiol* 1953;**175**:389–398.
3. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA et al.; ESC Scientific Document Group. Fourth universal definition of myocardial infarction (2018). *Eur Heart J* 2019;**40**:237–269.
4. Karamasis GV, Pavlidis AN. Osborn waves masquerading as ST-segment elevation myocardial infarction. *Int J Cardiol* 2014;**177**:e51–e52.
5. Collet JP, Thiele H, Barbato E, Barthélémy O, Bauersachs J, Bhatt DL et al.; ESC Scientific Document Group. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur Heart J* 2021;**42**:1289–1367.
6. Rolfast CL, Lust EJ, de Cock CC. Electrocardiographic changes in therapeutic hypothermia. *Crit Care* 2012;**16**:R100.