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Case Report

Unusual syncope due to silent coronary vasospasm: a case description and an overview of coronary vasospasm

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Abstract: Variant angina is a condition triggered by the transient vasospasm of epicardial coronary arteries, which usually causes chest pain episodes and may be associated with dangerous arrhythmias. Among patients with coronary artery vasospasm, a non-negligible subset experiences silent myocardial ischemia, defined as the objective documentation of myocardial ischemia in the absence of angina or anginal equivalents. This condition is associated with the increased cardiac mortality and incidence of acute cardiac events. Herein, we described the case of a 65-year-old man who was admitted to our Emergency Department (ED) for syncope. He reported palpitations before the event but did not complain of chest pain. Baseline electrocardiogram (ECG) showed that troponin values of biphasic T waves in V2-V6 were normal. The patient was admitted to our coronary care unit (CCU) for monitoring. Immediately after hospital admission, he developed dynamic ST segment elevation and non-sustained polymorphic ventricular tachycardia, being symptomatic only for palpitations. Both ECG abnormalities and symptoms quickly resolved after the administration of intravenous nitrates and oral calcium channel blockers. Coronary angiography showed a critical non-occlusive fixed stenosis at the proximal right coronary artery (RCA). The lesion was treated by angioplasty and stenting, and the patient was discharged on dual antiplatelet therapy, statins and oral high-dose calcium-channel antagonist.

Keywords: Silent coronary spastic angina, Syncope, Coronary spasm

Learning objective

We described an unusual case of syncope in a patient affected by silent coronary spastic angina causing ventricular arrhythmias. Physicians should be aware of this condition when evaluating patients with syncope of non-obvious origin in the emergency department (ED).

Introduction and an overview of coronary spasm

Variant angina was first described by Prinzmetal et al [1] in the late fifties. Different from classical angina, variant angina occurs typically at rest (although the correlation with mild exercise has been reported [2]) and follows circadian variations with a peak of incidence from midnight to early morning [1]. In a modern view, variant angina is included in the spectrum of myocardial ischemic syndrome caused by coronary spasm and is usually called coronary vasospastic angina [3]. This condition is due to the transient vasospasm of epicardial coronary arteries, which typically causes electrocardiogram (ECG) changes and chest pain episodes. The spasm is defined as an enhanced contraction of an epicardial coronary artery causing myocardial ischemia, and its pathogenesis

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has not been fully elucidated yet, although an important role is played by endothelial dysfunction, oxidative stress, chronic inflammation and smooth muscle hyper-contractility [4-6]. It can be characterized by different degrees of coronary constriction (from increased constriction to total occlusion), usually affects the entire coronary artery (although different degrees of constriction may be presented in different segments of the artery) and can occur in either a normal or a diseased coronary artery, most commonly within 1 cm of an atherosclerotic plaque [2, 7]. The spasm usually occurs in one vessel and often the same vessel during each attack in the same patient; however, in some cases, the vessel may vary among different attacks, and simultaneous multivessel spasm (often resulting in ventricular fibrillation) is possible. The chest pain is similar to that of classical effort angina, although it is often greater in intensity and length and more often accompanied by sweat, nausea and syncope 3. Coronary vasospasm may be associated with various forms of arrhythmias (atrioventricular block, asystole or ventricular tachyarrhythmias) and several clinical conditions such as acute coronary syndrome and sudden cardiac death [8-10]. ECG features may include ST elevation (typical presentation in the case of total or subtotal occlusion of a major epicardial coronary artery) with reciprocal ST segment depression in specular leads, ST segment depression, T-wave peaking or T-wave inversion. Notably, up to a third of patients with coronary artery vasospasm experience silent myocardial ischemia [3], defined as the objective documentation of myocardial ischemia in the absence of angina or anginal equivalents and dependence on a high threshold of chest pain/oppression [11]. This condition is more frequent in patients affected by variant angina as compared to patients with classic angina and is associated with the increased mortality and incidence of acute cardiac events [12]. The therapeutic approach encompasses both the treatment of the acute attack, mainly based on the use of sublingual, oral spray or intravenous nitrates and the prevention of further coronary spasms based on the use of calcium channel blockers (CCBs) and long-acting nitrates. In addition, the control of risk factors for coronary atherosclerosis promoting endothelial dysfunction is beneficial.

Case report

A 65-year-old man was admitted to our emergency department (ED) for the transient loss of consciousness while walking. He was an active smoker (15 cigarettes/day), affected by hypertension on the treatment with angiotensin-converting enzyme (ACE) inhibitors and dyslipidemia not in the treatment with any drugs; he did not report any familiar history of cardiovascular disease. A moderate alcohol intake (one glass of wine with meals) and no other significant past medical issues were reported. The patient experienced palpitations without chest pain immediately before the syncope and felt well shortly after. He did not report similar episodes in the past. No remarkable findings were noticed during the physical examination; the patient was apyretic and normotensive (blood pressure: 110/75 mmHg) and presented a normal respiratory rate. Baseline ECG showed normal sinus rhythm and biphasic T wave in V2-V6 (Figure 1A). Laboratory tests revealed troponin values in the upper normal range and no other significant abnormalities at admittance (white blood cells 7.6 × 103/microL, hemoglobin 15.9 g/dl, platelets 202 × 103/ml, creatinine 0.97 mg/dl, potassium 3.8 mmol/l, CK MB 5.2 mg/l, routine urine test with normal aspect, pH and no detection of nitrites, proteins, glucose, ketones, bilirubin or casts). Transthoracic echocardiography and neurological examination showed normal findings. Due to ECG abnormalities and reported palpitations, the patient was admitted to our coronary care unit (CCU) for monitoring. Briefly after admission, he developed dynamic ST elevation at ECG monitoring and subsequently premature ventricular complex (PVC) and non-sustained ventricular tachycardia (NSVT) (Figure 2A-F). At this stage, the patient was completely asymptomatic for chest pain but reported palpitations. Twelve-lead ECG revealed ST elevation in the inferior leads, specular ST depression in the lateral leads and ST depression in the V2-V3 expression of inferior and posterior transmural ischemia (Figure 1B). The patient was then given nitrate boluses with the prompt normalization of ST segment and the immediate cessation of ventricular arrhythmias. Given the fast resolution of ECG abnormalities and rhythm disturbances with nitrates, the patient did not immediately undergo a coronary angiogram and was given orally a high dosage of CCBs (diltiazem 120 mg) without the further recurrence of ST segment elevation. Subsequent troponin controls were negative. Coronary angiography was performed, showing a non-occlusive (85%) obstruction at the proximal right coronary artery (RCA) level (Figure 3A). The lesion was successfully treated by angioplasty and stenting (Figure 3B). The patient's clinical course was favorable with no recurrence of symptoms and the gradual normalization of ECG. He was discharged 5 days after admission on dual antiplatelet therapy, statins and high dosage CCBs (diltiazem 120 mg b.i.d.).

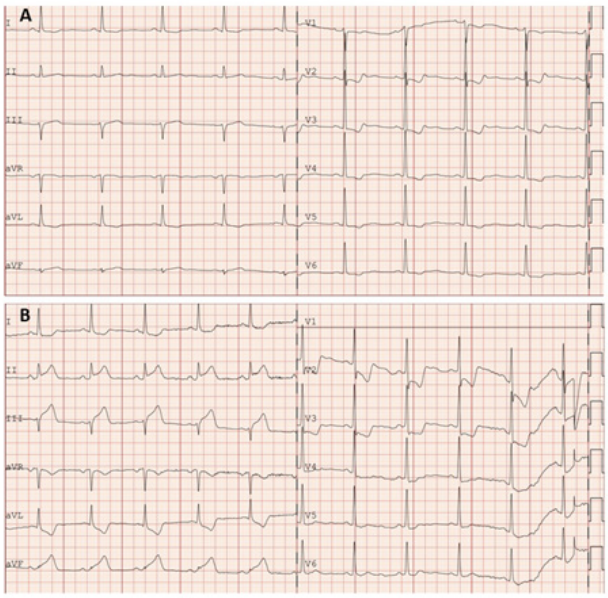

Figure 1. **A.** Twelve-lead ECG at admission showing ST depression associated with biphasic T wave in V2-V6. **B.** Twelve-lead ECG during silent vasospasm characterized by ST elevation in the inferior leads, specular ST depression in the lateral leads and ST depression in the V2-V3 expression of inferior and posterior transmural ischemia (due to technical issues, V1 could not be registered). Sinus rhythm with intraventricular conduction disturbances.

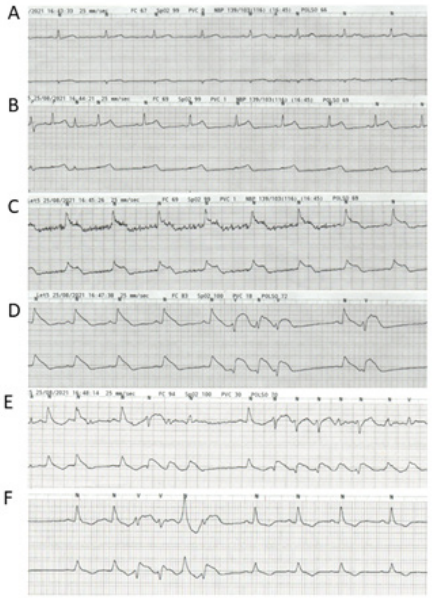

Figure 2. Two-lead ECG continuous monitoring showing sequential phases of silent ischemia due to coronary artery vasospasm:

A. Normal sinus rhythm with normal ventricular repolarization
B. Initial ST segment elevation
C. Marked ST segment elevation
D. PVC
E. NSVT
F. Restored sinus rhythm with intraventricular conduction disturbances (resolution of the spasm).

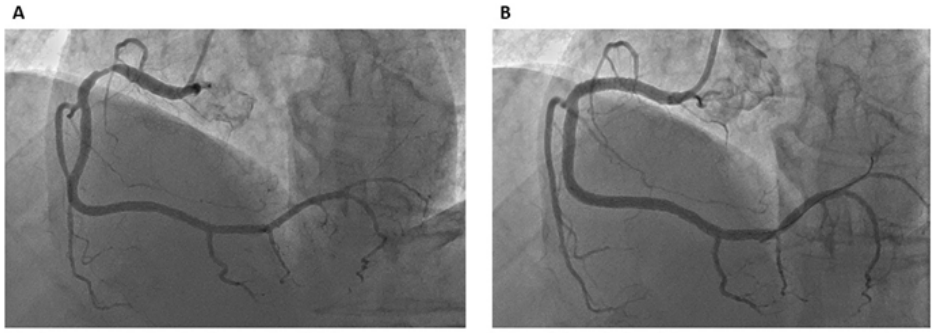

Figure 3. The critical coronary lesion in the proximal RCA before (**A**) and after (**B**) percutaneous coronary intervention.

Discussion

In the present report, we described an unusual case of syncope in a patient experiencing coronary artery spasm that occurred at the site of a fixed plaque in the proximal RCA causing dangerous ventricular arrhythmias.

This case underlines first of all the importance of searching for the presence of high-risk features when evaluating patients with syncope of non-obvious origin in the ED. Many diseases can cause syncope, which is defined according to European guidelines as a state of loss of consciousness due to cerebral hypoperfusion characterized by a rapid onset with spontaneous complete recovery, amnesia for the period of unconsciousness, abnormal motor control and short duration. According to the latest classification [13], syncope can be classified into 3 main types based on pathophysiology: reflex (including vaso-vagal, situational, carotid-sinus syndrome and others), orthostatic hypotension (OH, including drug-induced OH, volume depletion, and primary and secondary autonomic failure) and cardiac syncope (including bradycardia, tachycardia, structural cardiac disease, and cardiopulmonary and great vessel disease). The specific nature of syncope is sometimes suggested by specific clinical features collected from medical history, physical examination, blood pressure (including orthostatic measurement) or ECG recording. In the case where the diagnosis is certain or highly likely from those features, the appropriate treatment should be started. Otherwise, to allow proper management (i.e., discharge from the ED and referral to the syncope out-patient clinic or hospital admission for monitoring or treatment), a risk stratification should be done given the short-term risk of serious events and the rate of recurrence. In particular, it is mandatory to verify whether any of the high-risk features is present: clinical (cardiac symptoms, syncope during exertion, palpitations preceding syncope, blood pressure < 90 mmHg, persistent bradycardia, evidence of gastrointestinal bleeding or undiagnosed systolic murmur), anamnestic (history of severe structural or coronary artery disease) and electrocardiographic (signs of ischemia, tachyarrhythmias or bradyarrhythmias, bundle branch blocks, signs suggestive of long QT syndrome (LQTS), Brugada syndrome or arrhythmogenic right ventricular cardiomyopathy). Our patient reported palpitations immediately before syncope and presented ECG changes consistent with myocardial ischemia (even in the absence of chest pain, raised troponin values and normal echocardiographic findings). Both these elements are strongly suspicious for syncope of cardiac origin. Indeed, a sudden onset of palpitations immediately followed by syncope is highly suggestive of tachyarrhythmia as the main cause of the syncope; on the other hand, ischemic ECG findings may indicate ischemia per se as the cause of syncope or as the cause of the arrhythmia inducing syncope. The fact that physical examinations (specifically neurological examinations) are normal, as they are blood tests and vital signs, reinforce the suspicion of syncope of cardiac origin. Thus, although it is difficult to suspect the correct diagnosis from the initial information available in the ED, a prompt risk stratification correctly classify the patient as at "high-risk", suggesting hospital admission in a monitored bed. Compared with other patients affected by syncope occurring during ventricular arrhythmias due to ischemic causes, the patient in the reported case did not complain of any chest pain despite the presence of ST elevation at ECG monitoring, a condition known as silent ischemia [11].

Cardiac biomarkers such as troponin and B-type natriuretic peptide, suggestive of myocardial infarction and heart failure, respectively, can be helpful to distinguish cardiac from non-cardiac syncope [14, 15] and might be useful to identify patients at risk for short-term major adverse cardiovascular events, even if considerable heterogeneity has been reported among studies [14, 15]. Interestingly, in the reported case, troponin values were negative at admission, likely due to the transient nature of vasospasm, whereas B-type natriuretic peptide was not available as it was not routinely performed in the patient admitted for syncope.

The transient nature of ECG modification and ventricular arrhythmia, their dramatic response to nitrates/CCB and coronary angiography findings were suggestive of silent vasospasm [16]. Coronary vasospasm induces transient myocardial ischemia and thus may cause

ventricular arrhythmias [17], which in turn can cause syncope due to transient cerebral hypoperfusion or, when sustained, even cardiac arrest and sudden death [18, 19].

We did not perform provocative tests with acetylcholine or ergonovine due to the likely vasospastic origin of myocardial ischemia and to their potential risks, especially given the presence of ventricular polymorphic non-sustained tachycardia documented at ECG monitoring. Furthermore, according to European guidelines [20], invasive testing for non-invasive diagnosed patients responsive to drug therapy is qualified as a Class IIb recommendation (controversial indication). Notably, the chief complaint of the patient was palpitations which occurred before syncope, likely due to syncopal VT, and during hospitalization when episodes of NSVT were registered.

In conclusion, we describe a case of syncope due to silent coronary vasospasm inducing ventricular arrhythmias in a patient who experienced syncope preceded by palpitations in the absence of chest pain and presented with repolarization abnormalities at ECG. Physicians should be aware of this condition when evaluating patients with syncope of non-obvious origin in the ED.

Author Contribution

Conceptualization: SA, AM, CS, CS; Data collection: SA, AM, BE; Methodology: SA, AM, BE, GM, CS, CS; Writing-original draft: SA, AM, BE, GM; Writing-review & editing: SA, AM, BE, CS, GM, CS, BP; Approval of the final manuscript: BP, CS, CS; Supervision: BP.

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Informed Consent Statement

The written informed consent was obtained from the patient.

Disclosure

There are no financial conflicts of interest to disclose.

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