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Case report

Anaphylactic cardiovascular collapse manifesting as myocardial infarction following salad consumption. A case of Kounis variant type I syndrome

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Summary. Anaphylactic cardiovascular events constitute an underrated cause of medical emergencies in hospitalized patients. Coronary arteries and myocardium are targeted by anaphylactic mediators leading to acute coronary syndrome and imminent cardiovascular collapse. Early diagnosis and high clinical suspicion are required to secure prompt life-saving treatment in these cases. However, physicians of both Cardiology and Internal Medicine Departments are not familiar with this condition. Recently, we diagnosed and treated a case of anaphylactic cardiovascular collapse manifesting as acute myocardial infarction following salad consumption. Notably, Kounis anaphylaxis-associated acute coronary syndrome is a rare cause of ST segment elevation myocardial infarction with normal or diseased coronary arteries. We recommend that Kounis syndrome and its variants should be taken into consideration in the differential diagnosis of ischemic heart disease in patients with signs of allergic reaction and/or medical history of previous allergic reactions, who experience acute coronary syndrome after exposure to certain environmental stimuli. (www.actabiomedica.it)

Key words: acute coronary syndromes, allergic myocardial infarction, Kounis syndrome

Introduction

Anaphylactic cardiovascular events constitute an underrated cause of medical emergencies in hospitalized patients. A growing body of evidence suggests that the myocardium and the coronary arteries are substantially targeted by anaphylactic mediators (1,2). In this context, anaphylaxis-associated acute coronary syndrome (ACS) and myocardial dysfunction in line with systemic detrimental effects may ultimately lead to cardiovascular collapse (1-3).

Despite advances in management of acute coronary syndromes, patients with an anaphylactic cardiovascular event may necessitate additional treatment with anti-allergic drugs on top of anti-ischemic and anti-thrombotic therapy (3). Importantly, physicians should recognize early this clinical entity to ensure prompt and effective life-saving treatment. Nevertheless, anaphylactic cardiovascular collapse is understated in medical literature and the incidence, optimal treatment and prognosis of this condition are not delineated (3). Here we describe a case of Kounis anaphylaxis-associated acute coronary syndrome.

Case report

A 62-year-old Caucasian woman, presented to our emergency department with loss of consciousness, approximately 20 minutes after the consumption of a green home-made salad that included vegetables, tomatoes and peppers. Before arriving at the hospital,

the patient complained of shortness of breath, dizziness, excessive sweating, generalized pruritus, erythema and vomiting. Her previous medical history was significant for essential hypertension under treatment with valsartan 160 mg, once a day; while she reported two previous episodes of mild allergic reaction in the last decade to unknown stimuli, for which she had not sought further medical consultation. The patient did not have any history of tobacco, alcohol or illicit drug use. None of her medication was recently initiated.

Physical examination revealed an ill-appearing patient with diaphoresis and cold extremities in mild confusion that could not answer questions and follow commands. Diffuse erythema was present, whereas no specific skin rash or lesions were identified. Her vital signs were within normal limits for temperature and respiratory rate but included severely depressed blood pressure of 65/45 mmHg and a peripheral oxygen saturation of 43%. Lung auscultation did not reveal adventitious sounds and cardiac examination was negative for murmurs or gallops. The electrocardiogram revealed ST segment elevation in leads II, III, aVF, V6 and ST segment depression in leads aVL, V1-V4 (Figure 1). Arterial Blood Gas measurements showed severe acidosis, hypokalemia, hypercapnia and hypoxia (pH: 7.08, pCO_2: 71 mmHg, pO_2: 35 mmHg, K: 2.6 mmol/L, HCO_3: 16.1 mmol/L). The patient underwent a prompt orotracheal intubation and was then transferred to the Coronary Care Unit (CCU), where she was treated with intravenous administration of normal saline, norepinephrine, dimethindene maleate, hydrocortisone sodium succinate, midazolam and ranitidine and was hemodynamically stabilized. The transthoracic echocardiography study showed

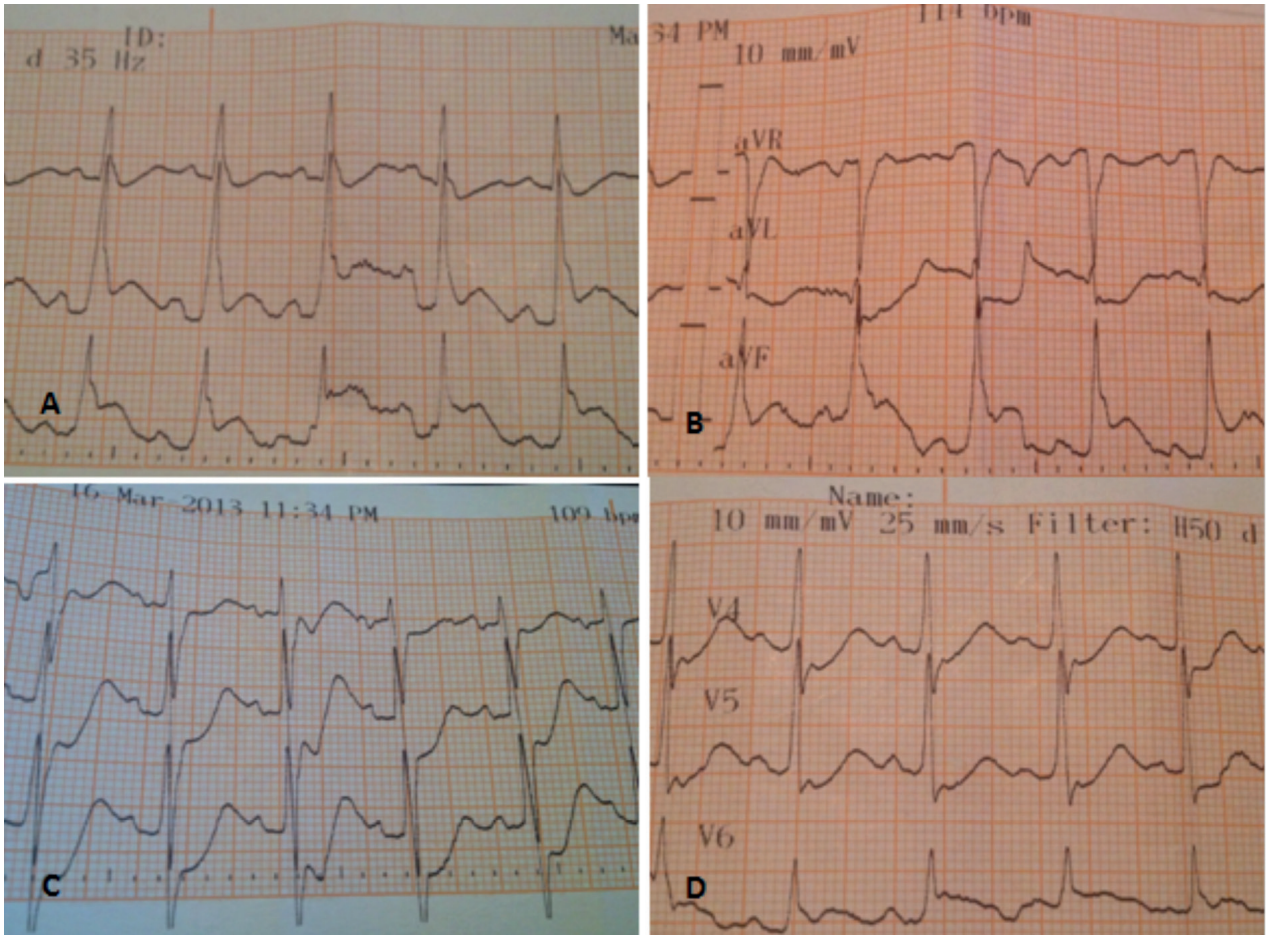

Figure 1. Admission electrocardiogram **A**. Leads I, II, III; **B**. Leads aVR, aVL, aVF; **C**. Leads V1, V2, V3; **D**. V4, V5, V6

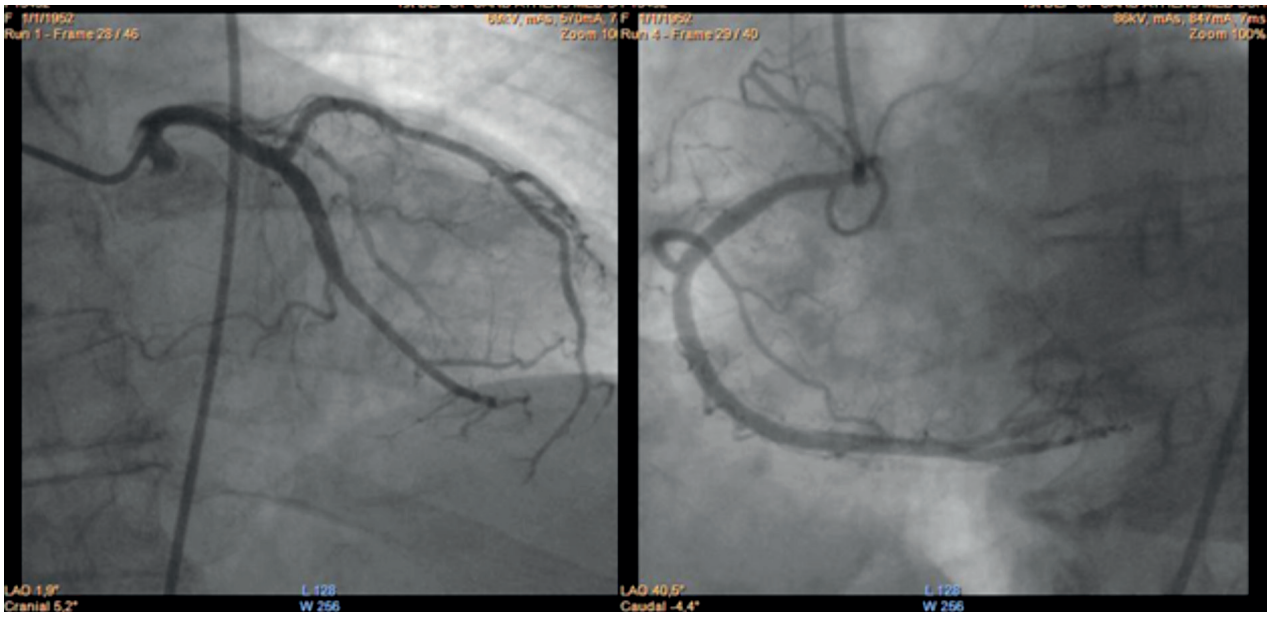

Figure 2. Coronary angiography of i. Left Descending Artery and Left Circumflex Artery in Left anterior oblique (LAO-2°) view with 5° cranial angulation; ii. Right Coronary Artery (RCA) in Left anterior oblique (LAO-40°) view with 4° caudal angulation

normal-sized cardiac chambers and normal left and right ventricular systolic function with normal valvular structure. Finally, troponin I was 0.17 ng/ml [reference values: <0.04 ng/ml], indicative of myocardial injury.

After successful weaning from inotropes (6 hours from admission to CCU, Day 1), a coronary angiogram was performed and revealed coronary arteries without significant stenoses (Figure 2). The patient returned to the CCU and was extubated the following day (Day 2), showing a sinus rhythm, and no ST-segment or T-wave abnormalities on ECG. Peak troponin I was 0.76 ng/mL and returned to normal the 5th day of hospitalization. Due to severity of anaphylaxis skin prick tests and/or oral challenge were not carried out on ethical grounds. The patient was discharged 6 days after the admission with the diagnosis of Kounis type I variant syndrome.

Discussion

The described patient developed anaphylactic reaction with shortness of breath, dizziness, sweating, pruritus, erythema, vomiting and profound hypotension with oxygen desaturation 20 minutes following the consumption of a green home-made salad that included vegetables, tomatoes and peppers. The accompanied electrocardiographic changes together with the increased of serum troponin were suggestive of inferolateral myocardial injury. This patient had suffered allergic reactions in the past and was considered as an atopic patient.

Tomatoes, green peppers and vegetables are among the most common and consumed foods worldwide. However, tomato (Solanum lycopersicum) is a common source of plant food allergens and allergic reactions, frequently occurring also in patients suffering from birch pollen allergy. Approximately 1.5% of the population in Northern Europe and up to 16% in Mediterranean basin, indeed, displays some degree of allergy towards tomato (4). The tomato allergen Sola l 4 has similar protein content with the major birch pollen allergen Bet v 1, thus making patients to cross-react easily with allergenic proteins from tomato as well as other fruits or vegetables (5).

On the other hand, the green and red pepper (Capsicum annuum) allergens osmotin, or thaumatin-like protein (Cap a 1, 23 kDa), and profilin (Cap a 2, 14 kDa) act as plant panallergens and are involved in cross-reactivity between pollen and various vegetable

foods (6). Therefore, all the ingredients of the salad consumed by the described patient, could have acted as allergens able to induce anaphylaxis and the Kounis syndrome. It is known that the more allergens an atopic patient is exposed to, the easier and quicker anaphylactic shock and Kounis syndrome occur (7). At the best of our knowledge, this is the first case of Kounis syndrome to be reported following tomato salad consumption. Kounis syndrome is defined as an acute coronary syndrome that manifests as unstable vasospastic or nonvasospastic angina, and even as acute myocardial infarction (AMI) triggered by the release of inflammatory mediators following an allergic insult (8,9). Currently, 3 variants of Kounis syndrome are identified. The first variant (Type I) includes patients with normal coronary arteries, without predisposing factors for coronary artery disease, in whom the acute release of inflammatory mediators can induce either coronary artery spasm without increase of cardiac necrosis enzymes or coronary artery spasm progressing to AMI with raised markers of myocardial injury. The second variant (Type II) includes patients with quiescent pre-existing atheromatous disease in whom the acute release of inflammatory mediators can induce either coronary artery spasm with normal cardiac enzymes or plaque erosion/ rupture manifesting as AMI. The third variant (Type III) includes patients with coronary thrombosis (including stent thrombosis) in whom aspirated thrombus specimens stained with hematoxylin-eosin and Giemsa demonstrate the presence of eosinophils and mast cells respectively (10).

Along this line, the term "cardiac anaphylaxis" refers to the functional and metabolic changes in the heart caused by the release of histamine and metabolites arising from the arachidonic acid cascade following a serious allergic insult. Several pathophysiologic mechanisms have been described to explain the involvement of this organ in anaphylactic reactions. The existence of mastocytes in heart tissue and their participation in the anaphylactic reaction that triggers tachycardia, coronary vasoconstriction, dysfunctional ventricular contractility, and blockade of atrioventricular conduction is well known (11). These abnormalities are attributed to the release of mediators such as histamine, thromboxane, prostaglandins, leukotrienes, and platelet activation factor. The release of renin during episodes of anaphylaxis and its involvement in consequent myocardial dysfunction has been described as well (12).

Several allergens have been reported to trigger Kounis syndrome, such as drugs, hymenoptera or spider venom, food, latex, and contrast media (13-15). In our case, the patient reported consumption of a green salad, which may has triggered the allergic reaction mediating the ST elevation myocardial infarction with normal coronary arteries. A sound association of the previous two episodes of allergic reaction after exposure of the patient to identical or relevant stimuli (i.e. green vegetables, tomatoes, peppers) was not established. It is known, however, that patients suffering from atopic diathesis with previous history of allergic reactions, as the described patient, are at a higher risk of hypersensitivity, allergy and anaphylaxis (14).

Conclusion

We report on a rare cause of Kounis anaphylaxis-associated acute coronary syndrome. We acknowledge that the exact pathophysiologic mechanisms of Kounis syndrome are not fully elucidated. However, Kounis syndrome should always be taken into consideration in the differential diagnosis of ischemic heart disease in patients with medical history of previous allergic reactions, who experience acute coronary syndrome after exposure to certain environmental stimuli including the commonly used tomato salad.

Conflict of interest: None to declare

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