

Kounis syndrome presenting as ST elevation acute myocardial infarction

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ABSTRACT

Allergic acute coronary syndrome, Kounis syndrome, is a rare cause of ST-segment elevation myocardial infarction triggered by an allergic reaction to a drug or environmental allergen, resulting in atheromatous plaque rupture or coronary artery vasospasm. We report three cases of Kounis syndrome presenting as ST-segment elevation myocardial infarction.

KEYWORDS Acute coronary syndrome; atherosclerosis; cardiovascular disease; coronary angiography; myocardial infarction; percutaneous coronary intervention

The first reported acute myocardial infarction during an allergic reaction to penicillin was published in 1950.¹ In 1991, Kounis and Zavras first described the “syndrome of allergic angina.”² Later, Constantinides (1995) and Braunwald (1998) postulated that allergic reactions can promote spasm and plaque disruption.^{3,4} Kounis syndrome (KS) is defined as the occurrence of acute coronary syndrome in the setting of conditions associated with mast cell activation, including allergic, hypersensitivity, and anaphylactic reactions. Evidence suggests that mast cells, T cells, and macrophages migrate to atherosclerotic plaques, causing increased plaque vulnerability. Acute triggered reactions release various inflammatory cytokines, platelet-activating factors, and histamine, which induce vasospasm and plaque disruption.⁵

CASE DESCRIPTIONS

Case 1. A 65-year-old woman presented for outpatient robotic total knee replacement. She had a history of coronary artery disease and had had drug-eluting stents placed in the left anterior descending (LAD) artery and right coronary artery. During a preoperative infusion of vancomycin, she developed acute anaphylactic shock. An electrocardiogram (ECG) revealed inferolateral ST-segment elevation. Emergent coronary angiography (*Figure 1a*) revealed culprit thrombosis within the previous LAD stent, which was successfully treated with aspiration thrombectomy and intravascular ultrasound-guided balloon angioplasty. Eptifibatide was

administered by double bolus followed by continuous infusion for 6 hours after the procedure.

Case 2. A 69-year-old man with a past medical history of metabolic syndrome and known coronary artery disease, treated with drug-eluting stents placed in the left posterior descending artery and LAD, presented to the hospital following 100+ bee stings. Shortly afterwards, he began to experience substernal chest pressure, dyspnea, and skin wheals throughout his body. Upon arrival to the emergency department, ECG revealed 2 mm ST-segment elevation in leads II, III, and aVF, and 1 mm elevation in lead I and the lateral precordial leads. He was treated for acute coronary syndrome and brought emergently to the catheterization lab. Coronary angiography (*Figure 1b*) revealed plaque rupture of the second obtuse marginal branch of the left circumflex coronary artery. Direct stenting was performed.

Case 3. A 67-year-old man with a history of mild nonobstructive coronary disease presented to the emergency department following more than 100 bee stings. He developed anaphylactic shock and was treated appropriately. He developed chest pain and ST elevation in leads II, III, and aVF on ECG and was taken emergently for cardiac catheterization. There was a large thrombus burden in the left main, LAD, first diagonal, and right coronary arteries. The LAD was completely occluded distal to the first diagonal (*Figures 1c–1e*). The right coronary artery had sequential moderate to severe stenoses with distal vessel thrombus and a 100% occluded posterior descending artery (*Figure 1f*). Aspiration thrombectomy was performed in the

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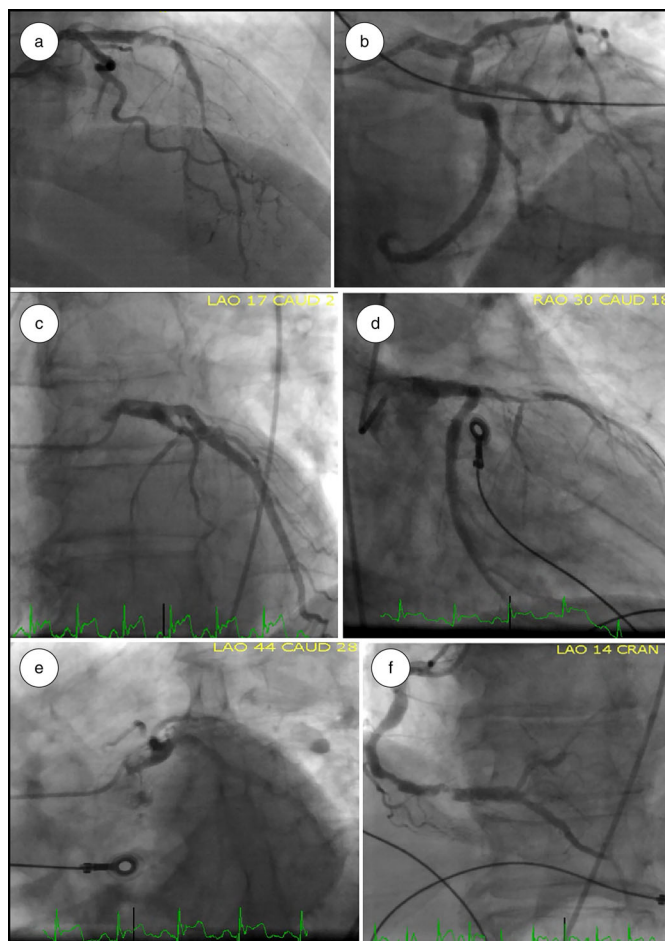


Figure 1. Coronary angiograms (a) demonstrating thrombus within the prior left anterior descending stent in Case 1 and (b) demonstrating plaque rupture and severe stenosis of the obtuse marginal branch of the left circumflex artery in Case 2. In Case 3, angiograms demonstrating (c) thrombus in the left main coronary artery; (d) mobilization of thrombus into the left anterior descending artery; (e) thrombus in the left main coronary artery; and (f) sequential high-grade right coronary artery stenoses with occlusion of the distal posterior descending artery.

above vessels, as well as angioplasty and bare metal stenting of the proximal LAD and the mid right coronary artery.

Pertinent characteristics of each patient are summarized in [Table 1](#).

DISCUSSION

There are three recognized subtypes of KS. Type I is described as coronary vasospasm, with or without myocardial infarction, in the setting of normal coronary arteries. Type II is coronary vasospasm or plaque erosion, rupture, or thrombosis in the setting of quiescent preexisting coronary artery disease. Type III involves acute stent thrombosis of a previously placed coronary stent. A systematic review of 175 patients revealed that type I KS is the most prevalent, totaling 72.6% of cases. The two most common identified triggers are antibiotics (27.4%) and insect bites (23.4%). In general, the prognosis of type I KS is more favorable than the latter two variants.⁶ We have presented a series of the rarer variants of KS, type II and III, all of which had positive response to therapy in the acute setting with prompt

recognition and treatment. In follow-up, Cases 1 and 2 have had uncomplicated recoveries without any pertinent long-term sequela. Unfortunately, Case 3 succumbed to congestive heart failure and died approximately 6 months after his myocardial infarction from KS. These cases also illustrate that multivessel pathology may be present and emphasize the thrombotic potential of KS.

Unique to KS, acute coronary syndrome occurs in the setting of an allergic insult. Stress-induced cardiomyopathy should be included as a differential diagnosis. Coronary angiography and echocardiography are necessary to identify the true diagnosis. There are no established consensus guidelines regarding the management of KS. This is a complex and challenging scenario that has conflicting modes of therapy. Both the cardiac and allergic mechanisms need to be considered during treatment. It is reasonable to treat KS patients with steroids, H1 and H2 blocker antihistamines, antiplatelet agents, and anticoagulation. If hemodynamic instability from anaphylaxis occurs, this would be appropriately managed with intravenous fluids, steroids, and sulfite-free intramuscular

Table 1. Characteristics of three cases of Kounis syndrome

Variable	Case 1	Case 2	Case 3
Age	65	69	67
Sex	Female	Male	Male
Prior CAD	Yes	Yes	Yes
Prior stents	Yes	Yes	No
Known allergies	Latex	None	None
Allergic exposure	Vancomycin	Bee sting	Bee sting
Anaphylactic shock	Yes	No	Yes
Kounis syndrome type	III	II	II
Medical treatment before angiography	600 mg rectal aspirin, 4000 U IV heparin, 0.3 mg IM epinephrine, 60 mg IV methylprednisolone, 50 mg IV diphenhydramine	324 mg aspirin, 4000 U IV heparin, 300 mg clopidogrel, 80 mg atorvastatin	324 mg aspirin, 5000 U IV heparin, 0.3 cc IV epinephrine (1:1000 concentration), 125 mg IV methylprednisolone, IV fluids, 50 mg IV diphenhydramine
Angiographic findings	Thrombosis within previous LAD stent	Plaque rupture of obtuse marginal	Thrombus in left main and all three coronary arteries
Peak troponin (mg/dL)	5.4	5.58	84.38
Echo LVEF	Normal	63%	25%

CAD indicates coronary artery disease; IM, intramuscular; IV, intravenous; LAD, left anterior descending; LVEF, left ventricular ejection fraction.

or intravenous epinephrine.^{7,8} Early anticipation and recognition of acute coronary syndrome should occur in individuals experiencing acute allergic reactions, especially those with established diagnoses of coronary artery disease and/or previously placed coronary stents. If KS is identified, the patient should be brought emergently to the cardiac catheterization laboratory after therapies for acute coronary syndrome.

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