

Case Report

Acute myocardial infarction after prednisolone administration for the treatment of anaphylaxis caused by a wasp sting

ZEKERIYA ARSLAN, ATILA IYISOY, MURAT TAVLASOGLU

Abstract

Background: Wasp stings have been demonstrated to cause a wide spectrum of allergic reactions from localised reactions to anaphylaxis. Acute coronary syndromes have been described as potential complications of anaphylactic reactions or some of the drugs used for the treatment of anaphylaxis. We know of only a few cases reported of acute myocardial infarction (MI) following corticosteroid administration or anaphylaxis in subjects with normal coronary arteries. If it exists, underlying subclinical coronary atherosclerosis may become clinically evident.

Case report: A 20 year-old male with anaphylaxis due to a wasp sting, complicated by acute ST-elevation MI after intravenous methyl prednisolone administration, is the subject of this report. He was admitted to our emergency service for dizziness, blurred vision, presyncope and mild respiratory distress 10 minutes after the wasp had stung him on the nape of the neck. Six to seven minutes after administration of prednisolone, the patient complained of typical chest pains. A high posterolateral MI with mild mitral regurgitation were seen on examination. He was treated conservatively with aspirin and heparine. Coronary angiography and intravascular ultrasound imaging, performed 10 days later, showed no evidence of obstructive coronary artery disease.

Conclusion: Although reduced coronary perfusion, local histamine release-induced coronary vasospasm or severe hypoxia have been suggested, the pathophysiology remains unclear. Acute STEMI may be a rare but clinically important complication of a wasp sting, anaphylaxis or the corticosteroid used for its treatment, even in young adults with normal coronary arteries. Therefore, physicians should be aware of such serious complications in order to diagnose them early.

Keywords: acute myocardial infarction, wasp sting, anaphylactic reaction, prednisolone administration

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Department of Cardiology, Gelibolu Military Hospital, Canakkale, Turkey

ZEKERIYA ARSLAN, MD, zekeriya.arslan@gmail.com

ATILA IYISOY, MD

MURAT TAVLASOGLU, MD

Acute coronary syndromes may occur as a result of anaphylactic reaction or the drugs used for its treatment. Rare reports have revealed acute myocardial infarction (MI) following anaphylaxis in subjects with normal coronary arteries,¹⁻⁶ or in subjects with underlying ischaemic heart disease.⁷⁻⁹ Although coronary vasospasm, plaque activation and systemic hypotension have been suggested,¹⁰ its pathophysiology remains unclear. Corticosteroids have many side effects on the cardiovascular system and may provoke acute MI.¹¹

We present a case of acute ST-elevation MI (STEMI) after intravenous methyl prednisolone administration for the treatment of anaphylaxis following a wasp sting in a young patient with normal coronary arteries. The medical literature that pertains to this phenomenon is discussed.

Case report

A 20-year-old male was admitted to our emergency service with the symptoms of dizziness, blurred vision and mild respiratory distress 10 minutes after a wasp sting on the nape of the neck. There was only minimal local reaction and he was not in cardiac distress. He had no allergic history or any other cardiovascular risk factors, such as hypertension, diabetes, hyperlipidaemia, overweight, or family history of heart disease, but had been smoking for seven years. His blood pressure was 140/80 mmHg, heart rate was 88 beats per minute and oxygen saturation was 93% in room air. His white blood cell count was also normal [7.3×10^3 (with 3.6% eosinophils; $n < 4\%$)].

Considered as an allergic reaction, 40 mg methyl prednisolone and 10 mg chlorpheniramine maleate were administered intravenously in a slow infusion. However, the patient's condition deteriorated six to seven minutes later. He had typical chest pains and an ECG showed ST elevation with a reciprocal depression (Fig. 1a). His blood pressure also decreased markedly to 80/60 mmHg, the heart rate increased up to 100 beats per minute but O_2 saturation was normal.

Conservative therapy including aspirin, heparine, and volume replacement was administered but nitrates or calcium channel blockers could not be used due to hypotension at that time. The first bedside echocardiography revealed left ventricular posterior, lateral and apical wall movement abnormalities and mild mitral regurgitation (Fig. 2a). Left ventricular ejection fraction (LVEF), estimated by the modified Simpson method, was 35%.

The symptoms and clinical findings began to improve in approximately 25 minutes and the ST deviations resolved (Fig.

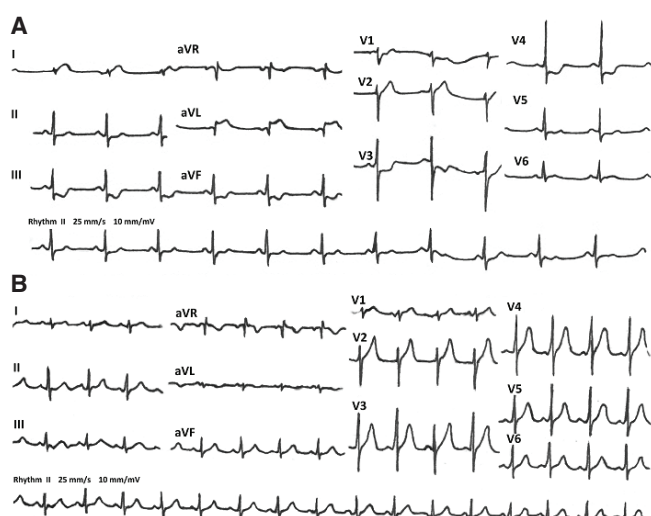


Fig. 1. A. ECG shows ST elevation with a reciprocal depression. B. After 25 min the ST deviations resolved.

1b). The wall movement abnormalities were limited to the posterior wall only and mitral regurgitation disappeared in two hours, as seen on the control echo (Fig. 2b). The cardiac enzyme levels had increased about two-fold in the sixth hour from that of baseline [creatinine kinase (CK-MB): 42 U/l (22 U/l at baseline; $n < 25$ U/l), troponin I: 3.12 ng/ml (0.01 ng/ml at baseline; $n = 0-2.00$ ng/ml)].

Because no coronary intervention facility existed closer than three hours away and the patient had stabilised in a short time, transferral of him was delayed for 10 days, for recovery. Coronary angiography showed no evidence of obstructive coronary artery disease. Intravascular ultrasound imaging (IVUS) (Atlantis 40 mHz, Boston Scientific Co, USA) also clearly demonstrated no evidence of coronary artery disease. An allergic stimulation test was not performed because the patient refused approval.

Discussion

An allergic reaction following a wasp sting has a wide spectrum varying from local reactions to anaphylaxis. Severe anaphylaxis may induce bronchospasm, profound vasodilation and angio-oedema. Underlying subclinical coronary atherosclerosis may also become clinically evident.

Cardiac involvement is an uncommon but important clinical finding with these conditions. There have been some such cases in subjects with normal coronary arteries,¹⁻⁶ and in subjects with coronary artery disease.⁷⁻⁹ Some originated from the anaphylaxis itself,^{4,8,9} or from drugs used for its treatment, including epinephrine.^{1-3,5-7}

The use of epinephrine to counteract possible systemic reaction in anaphylaxis has been revealed to cause MI.^{1,3} Although chlorpheniramine maleate rarely causes mild ventricular depression and transient bradycardia (if the administration is too fast), there is no known incidence of MI due to prednisolone or chlorpheniramine maleate administration in the literature.

The main mechanism proposed is vasospasm of the coronary arteries. Other mechanisms, such as plaque activation and systemic hypotension, may play a role in its pathogenesis. Hypotension may lead to global ischaemia in the heart rather than local myocardial infarction, therefore diffuse ST depressions

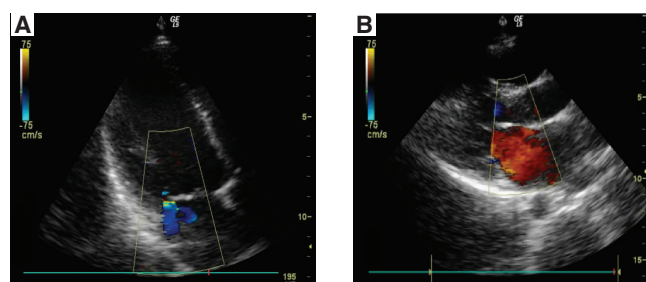


Fig. 2. A. Echocardiography shows left ventricular posterior, lateral and apical wall movement abnormalities and mild mitral regurgitation. B. Control echo after 2h shows posterior wall movement abnormalities only.

with ST elevation in the aVR would have been evident.

An hypothesis of the central role of mast cells, inflammatory cell activation and release of potent vasoactive mediators, called cardiac anaphylaxis, is also suggested.⁸ Kounis syndrome or allergic MI is defined as resulting in coronary vasospasm, which is mediated by vasoactive amines released by mast cells, and patients may also have eosinophilia.¹² The chemical composition of wasp venom basically consists of vasoactive amines and thrombogenic substances that are able to create vasospasm, and coronary thrombosis may play a role in the pathophysiological determination.

Clinically, anaphylaxis may induce an acute ischaemic burden due to a combination of reduced coronary perfusion pressure, tachycardia, and sometimes severe hypoxia. This combination of events may hamper adequate cardiac response to the extreme vasodilation, and even lead to reduced cardiac output and further deterioration. MI during the course of the allergic reaction in the absence of systemic hypotension has rarely been reported.¹³ However, our patient's blood pressure was not low, so it was not hypotension-induced myocardial infarction in our case. In a similar case, the possibility of severe coronary spasm associated with anaphylactic reaction was considered, even though other symptoms were mild or absent.⁷

Local histamine release seems to induce spasm of the coronary vasculature, thus leading to myocardial ischaemia and infarction. Eosinophilic basic proteins or vasoactive cytokines may directly stimulate constriction of nearby smooth muscle. Eosinophilic infiltration has been shown around the vasa vasorum and nerve fibres.¹⁴ Stimulation of these nerve fibres in the adventitia is another possible explanation for the vasospasm. ST elevation was seen in the majority of cases of vasospasm associated with eosinophilia, similar to Prinzmetal angina.¹⁵ Vasospasm-related symptoms may continue despite high-dose vasodilators but respond well to prednisone.

Corticosteroids may be speculated to have some role on the cardiovascular response. Owecki *et al.*¹¹ presented a case of a woman who received high doses of methylprednisolone (1 g iv daily) for active Graves' ophthalmopathy. Severe hypertension developed, followed by myocardial infarction on the fifth day of treatment, but in this case, the drug dose was high and hypertension played the major role in developing the MI.

On the other hand, a Löffler's endocarditis associated with unusual ECG change mimicking posterior myocardial infarction was successfully treated with prednisolone.¹⁶ Azar *et al.* reported a 48-hour course of anti-inflammatory therapy with methyl prednisolone did not change the short-term outcome of patients

with unstable angina.¹⁷

In this study, the mean C-reactive protein levels decreased with methyl prednisolone but the primary endpoint did not improve and the coronary revascularisation rates were equal. Takotsubo-like cardiomyopathy, which results from emotional or physical stress, is also another possible mechanism. However, ST-segment changes similar to this phenomenon, negative T and U waves and prolonged QT interval did not occur in our patient, and improvement was very fast.

It can be proposed that the MI in this case was caused by coronary spasm not anaphylactic reaction because the patient experienced the chest pain seven minutes after the prednisolone administration had ended. Additionally, an antihistaminic agent had already been given. During the allergic condition, the patient had had no cardiac discomfort for the first 10 minutes before admission.

Rarely, fast parenteral administration of corticosteroids for anaphylactic reactions may cause cardiovascular collapse, especially in patients with a history of drug allergy. Some authors postulate that acute episodes could be induced by corticosteroids, which increased the production of epinephrine and augmented the sensitivity of cardiomyocytes for catecholamines.¹⁸ However, in our case, the administration was longer than three minutes and the drug was diluted with saline.

Furthermore, the effect of prednisolone would not have been evident within seven minutes. So the reason for the coronary spasm was anaphylactic reaction, and the prednisolone could have treated the coronary spasm in the subsequent minutes.

Conclusion

Acute STEMI is a rare but clinically important complication of a wasp sting, anaphylaxis or corticosteroid used for its treatment, even in young adults with normal coronary arteries. Physicians should be aware of such serious complications in order to diagnose them early and treat properly. Therefore corticosteroid use should always be carefully considered and the patient should be monitored throughout.

References

- Gikas A, Lazaros G, Kontou-Fili K; Acute ST-segment elevation myocardial infarction after amoxycillin-induced anaphylactic shock in a young adult with normal coronary arteries: a case report. *BMC Cardiovasc Disord* 2005; **5**(1): 6.
- Brener ZZ, Zhuravenko I, Bergman M Acute myocardial injury following penicillin-associated anaphylactic reaction in a patient with normal coronary arteries. *Am J Med Sci* 2007; **334**(4): 305–307.
- Shaver KJ, Adams C, Weiss SJ. Acute myocardial infarction after administration of low-dose intravenous epinephrine for anaphylaxis. *Can J Emergency Med* 2006; **8**(4): 289–294.
- Rich MW. Myocardial injury caused by an anaphylactic reaction to ampicillin/sulbactam in a patient with normal coronary arteries. *Tex Heart Inst J* 1998; **25**(3): 194–197.
- Conraads VM, Jorens PG, Ebo DG, Claeys MJ, Bosmans JM, Vrints CJ. Coronary artery spasm complicating anaphylaxis secondary to skin disinfectant. *Chest* 1998; **113**(5): 1417–1419.
- Austin SM, Barooah B, Kim CS. Reversible acute cardiac injury during cefoxitin-induced anaphylaxis in a patient with normal coronary arteries. *Am J Med* 1984; **77**(4): 729–732.
- Lee S, Nikai T, Kanata K, Koshizaki M, Nomura T, Saito Y. [A case of severe coronary artery spasm associated with anaphylactic reaction caused by protamine administration] *Masui* 2005; **54**(9): 1043–1046.
- Del Furia F, Querceto L, Testi S, Santoro GM. Acute ST-segment elevation myocardial infarction complicating amoxycillin-induced anaphylaxis: a case report. *Int J Cardiol* 2007; **117**(1): e37–39.
- Salgado Fernández J, Penas Lado M, Vázquez González N, López Rico MR, Alemparte Pardavila E, Castro Beiras A. Acute myocardial infarction after anaphylactic reaction to amoxicillin. *Rev Esp Cardiol* 1999; **52**(8): 622–624.
- Del Furia F, Matucci A, Santoro GM. Anaphylaxis-induced acute ST-segment elevation myocardial ischemia treated with primary percutaneous coronary intervention: Report of two cases. *J Invasive Cardiol* 2008; **20**(3): E73–76.
- Owecki M, Sowiński J. Acute myocardial infarction during high-dose methylprednisolone therapy for Graves' ophthalmopathy. *Pharm World Sci* 2006; **28**(2): 73–75. Epub 2006 Jun 22.
- Kounis N. Kounis syndrome (allergic angina and allergic myocardial infarction): a natural paradigm? *Int J Cardiol* 2006; **110**: 7–14.
- Gupta MK, Gupta P, Rezaei F. Histamine – can it cause an acute coronary event? *Clin Cardiol* 2001; **24**(3): 258–259.
- Kajihara H, Kato Y, Takanashi H, Nakagawa E, Tahara E, Otsuki T, et al. Periarthritis of coronary arteries with severe eosinophilic infiltration: a new pathologic entity (eosinophilic periarthritis)? *Pathol Res Pract* 1989; **184**: 46–52.
- Wong CW, Luis S, Zeng I, Stewart R. Eosinophilia and coronary artery spasm. *Heart Lung Circ* 2008; **17**: 488–496.
- Maruyoshi H, Nakatani S, Yasumura Y, Hanatani A, Yamaguchi T, Yutani C, et al. Löffler's endocarditis associated with unusual ECG change mimicking posterior myocardial infarction. *Heart Vessels* 2003; **18**(1): 43–46.
- Azar RR, Rinfret S, Theroux P, Stone PH, Dakshinamurthy R. A randomized placebo-controlled trial to assess the efficacy of anti-inflammatory therapy with methylprednisolone in unstable angina (MUNA trial). *Eur Heart J* 2000; **21**: 2026–2032.
- Takagi S, Miyazaki S, Fujii T, Daikoku S, Sutani Y, Morii I, Yasuda S, Goto Y, Nonogi H. Dexamethasone-induced cardiogenic shock rescued by percutaneous cardiopulmonary support (PCPS) in a patient with pheochromocytoma. *Jpn Circ J* 2000; **64**(10): 785–788.