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Reversible myocarditis following Black widow spider (Latrodectus spp.) bite in Egypt

A case report

Ahmed G. Emara,[1] Abdel-Rhman A. Aboshady,[2] *Omar A. Aboshady,[3] Mohamed M. Shawqi[4]

Departments of [1]Cardiology, [2]Critical Care Medicine Unit and [3]Clinical Pharmacology, Faculty of Medicine, Menoufia University, Shebin ElKoum, Egypt*; [4]Faculty of Medicine, Benha University, Benha, Egypt*

**Corresponding author's email: omr.ali@med.menofia.edu.eg*

Abstract

Black widow spiders (BWSs) are poisonous spiders of the Arthropoda phylum that live in the Mediterranean region. The effects of BWS bites ranges from local damage to systemic manifestations including paresthesia, stiffness, abdominal cramps, nausea, vomiting, headache, anxiety, hypertension, and tachycardia. However, cardiac involvement following a BWS bite is uncommon. We report a 35-year-old man who developed acute pulmonary edema with electrocardiogram changes that showed ST elevation in leads I, aVL with reciprocal ST segment depression in infero-lateral leads with elevated cardiac biomarkers. Echocardiography showed regional wall motion abnormalities with an impaired ejection fraction of 40%. The condition was reversible after one week of supportive treatment, and the patient was discharged from the hospital with normal electrocardiogram, ejection fraction, and negative cardiac markers. A routine cardiac evaluation, serial ECG, serial cardiac markers, and echocardiography follow-up should be considered for any patient exposed to a BWS bite for detection of any potentially fatal cardiac abnormalities.

Keywords: Black widow spider; Egypt; Spider bites; Myocarditis; Heart failure; Kounis syndrome; Acute coronary syndrome.

Introduction

Black widow spiders (BWSs) are a rare but very poisonous species of the Arthropoda phylum that generally live in moderate climatic conditions.[1] These spiders are shiny black with a ventral red hourglass mark on females, while males have various dorsal red marks. Their size averages 3-10 mm, with females up to 13 mm in length. The spider venom includes a main toxic protein (α-latrotoxin) that primarily affects the motor nerve endings, leading to increased catecholamine release and acetylcholine consumption.[2]

Patients who have been bitten by a BWS typically complain of various clinical symptoms that range from local to systemic manifestations; a BWS bite can cause soft tissue damage at the site of the bite, with local to generalized pain and/or paresthesia.[3,6,7,15,16] In addition, priapism, stiffness, abdominal cramps, nausea, vomiting, headache, tremors, and/or anxiety have been reported.[3,5-8] A few patients have hypertension, tachycardia, and/or chest pain.[3-6,8,10,16] Only one study has reported acute kidney failure and rhabdomyolysis.[1] Myocardial involvement after BWS bites is uncommon, and only a limited number of cases have been recorded with no cases from Egypt.[3-5,7-10,15,16] Here, we report on a 35-year-old previously healthy man who developed myocarditis complicated by acute heart failure and pulmonary edema following a BWS bite, which is the first case reported from Egypt.

Case Report

A 35-year-old previously healthy man presented to our tertiary hospital 12 hours after having been bitten by a BWS on the lateral aspect of his right leg, 15 cm below the knee joint. After being shown various photos of spiders, the patient chose the photo of the BWS as the attacker spider. Within a few minutes of the bite, he developed local severe burning pain that rapidly involved all of his thigh. Fifteen minutes later, he became nauseous with severe diffuse abdominal pain, back pain, dizziness, headache, and severe muscle cramping in his lower limbs. On examination, he had priapism and generalized tremors.

On admission, he was noted to appear anxious and diaphoretic. His vital signs were as follow: blood pressure 150/100 mmHg, pulse rate 110/min, respiratory rate 40 /min, oxygen saturation 98%, and temperature 37.3°C. Physical examination revealed a 3 x 2 mm area of erythema at the bite site, board-like abdominal rigidity, and hyperactive stretch reflexes. Cardiac examination revealed rapid S_1 and S_2 with S_3, and no murmur or rub. Other than a slight leukocytosis (total

leucocyte count was 15×10^3; normal range $4\text{-}10\times10^3$) with mild elevation in the absolute eosinophilic count (0.9×10^3/L; normal range $0.0\text{-}0.4\times10^3$/L), laboratory findings and arterial blood gases were normal.

The patient was given tetanus prophylaxis with intravenous analgesics, hydrocortisone, anti-histamine (pheniramine maleate 22.75 mg/day), and fluids (Ringer's lactate 1.5 L/day). Anti-venom was not given because it is unavailable in Egypt.

Four hours later, the patient developed progressive dyspnea, orthopnea, and retrosternal chest pain. An electrocardiogram was obtained that showed an ST-segment elevation of 0.5 mm in leads I, and aVL with reciprocal ST-segment depression in leads II, III, aVF, and V2-V6 (Figure 1). Cardiac biomarkers were CK-MB 89.9 IU/L (0-25 IU/L) and cTnI 5.1 ng/ml (0-0.6 ng/ml). A chest radiograph showed exaggerated pulmonary vascular markings consistent with pulmonary edema. Echocardiography, done 17 hours of his presentation, revealed impaired left ventricular systolic function, with an ejection fraction of 42%. There were regional wall motion abnormalities, including hypokinesis of the mid-basal anterior, mid-basal posteroseptal, mid-lateral, and basal inferior walls, with preserved thickness. In addition, the pericardium was noted to be thickened, with a rim of pericardial effusion on the lateral wall (Figure 2).

The patient was admitted to the intensive care unit and was treated with intravenous furosemide 20 mg/8 h, nitroglycerine infusion, intravenous morphine, captopril 12.5 mg/8 h, and prophylactic enoxaparin 80 IU/24 h. Later, beta-blocker (bisoprolol 2.5 mg/24 h for 1 month) was added to maintain a heart rate of 60-70 bpm and good coronary perfusion.

The dyspnea improved rapidly after this supportive therapy. The pain, headache, dizziness, tremors and muscle cramps disappeared after 48 hours. However, hyperreflexia and priapism continued to the fourth day. The patient's cardiac enzymes, electrocardiogram and echo findings are shown in Table 1. He was discharged on the sixth day with resolution of his symptoms. At that point, his electrocardiogram had normalized and the ejection fraction was estimated to be 51% on repeated echocardiography.

Informed written consent for publication of this case report and figures was obtained from the patient.

Discussion

Our patient had developed the commonly reported symptoms of latrodectism, such as nausea, pain, muscle rigidity, headache, tremors, and muscle cramping.[3,5-8,15,16] In addition, a moderate degree of priapism was reported, which is also recorded in the literature.[3] The hypertension and tachypnea that our patient developed were similar to previous studies.[4,5,8,16]

Cardiac involvement following a BWS bite is uncommon. Only a few cases have been reported in the literature, with effects ranging from reversible myocarditis to acute severe fulminant heart failure and cardiogenic shock.[1,4,5,7-10] Table 2 summarizes the available reported cases with cardiac involvement after BWS bites in the literature. Most cases have been reported in males, and most of them had myocarditis after BWS bite.[3-5,7-10,15,16] The majority of cases presented with chest pain or other manifestations suggesting pulmonary edema or heart failure.[3-5,7-10,15,16] Eight cases showed elevated levels of cardiac biomarkers.[4,5,7-10,15,16] Only a few cases showed ST segment changes that were similar to our findings.[7-10,16] Cardiac dysrhythmia, such as atrial fibrillation and incomplete bundle branch block, have also been reported.[7,8]

Although the underlying mechanism of cardiac affection after a BWS bite is still not fully understood, there are many possible explanations, such as the direct toxic effect of α-latrotoxin on cardiomyocytes producing a form of toxic myopericarditis.[5,7-10] Recently, the hyperadrenergic state was claimed to primarily be involved (broken heart syndrome).[4] In addition, α-latrotoxin, which is a foreign protein, might induce an allergic reaction producing a form of hypersensitivity myopericarditis.[1] α-latrotoxin also induces inflammatory mediator release, which could induce coronary artery spasm (Kounis syndrome).[1]

From these proposed mechanisms of cardiac affection, the heart can be affected by two main pathologies: myopericarditis and/or coronary artery spasm. However, the clinical presentation depends on which of the two pathologies predominates. When coronary artery spasm is the dominant pathology, the main presentation is typically chest pain or even acute coronary syndrome. When myopericarditis predominates, however, the main presentation is heart failure and pulmonary edema. In echocardiography, hypersensitivity myopericarditis usually shows heterogeneous segmental wall motion abnormalities. In contrast, coronary artery spasm shows segmental wall motion abnormalities in certain territory. Late gadolinium enhancement in cardiac magnetic resonance shows patchy sub-epicardial distribution which is not consistent with any coronary territory. Distribution in coronary artery spasm, however, is usually in the sub-

endocardial and consistent with the infract-related artery. In our case, we suspect the pathology was mostly combined, with greater spasm, which was reflected in the electrocardiogram.

Treatment of the BWS bites depends mainly on the severity of presentation.[11] Most of cases are mild and only require oral pain medication and tetanus prophylaxis. In severe cases, however, parental opioids or/and benzodiazepines might be required.[11] Antivenom administration is reported to reduce pain duration to less than 24 hours in approximately 80% of cases; it is reported to reduce severity, with home discharge in 90% of patients.[11-13] However, allergic reactions, serum sickness, and rare reports of fatalities have been reported from antivenom administration.[11,13,14] Unfortunately, given that BWS bites are rare in Egypt, we did not have antivenom in our center.

Conclusion

To the best of our knowledge, this case is the first to be reported from Egypt and to present with electrocardiogram changes typical of acute myocardial infarction in the literature. From this case, clinicians should be aware that reversible myocarditis can occur after a BWS bite. Moreover, it is recommended that a complete cardiac evaluation be performed for every case of BWS bite to screen for myopericarditis and coronary artery spasm.

Authors' Contribution

AGE and AAA managed the case clinically. All authors contributed equally to literature review, drafting, and critically revising the final version of the paper.

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Table 1: ECG, cardiac enzymes, and ejection fraction findings over the admission period and one week after discharge

	ECG	**Cardiac enzymes**		**Ejection fraction**
		CK-MB (0 - 25IU/L)	**cTnI** (0 - 0.6 ng/ml)	
Four hours after admission	ST-segment elevation (0.2 mv) in leads I, aVL with reciprocal depression (0.3 mv) in II, III, aVF and V2-V6	89.9 IU/L	5.1 ng/ml	42%
Ten hours after admission	ST-segment elevation (0.1 mv) in leads I, aVL with reciprocal depression (0.2 mv) in II, III, aVF and V2-V6	79.08 IU/L	Not done	Not done
One day after admission	ST-segment elevation (0.1mv)in leads I, aVLwith reciprocal depression (0.2 mv) in II, III, aVF and V2-V6	24.07 IU/L	3.2 ng/ml	43%
Two days after admission	Normal	6.5 IU/L	0.5 ng/ml	51%
One week after discharge	Normal	6.1 IU/L	0.5 ng/ml	56%

204 **Table 2:** Available reported cases with cardiac involvement after BWS bites in literature.

Year	Age/sex	Cardiac presentation	ECG	Echocardiography	Cardiac markers	Diagnosis
Piscopo et al., 2020[15]	50/M	Not mentioned	- Diphasic T wave in the lateral leads at admission. - At day 3, ECG showed sinus rhythm and negative T wave in the lateral and inferior leads.	-Abnormalities in left ventricular wall motions and moderate systolic dysfunction (hypokinesia of LV middle/ basal segment of inferior, lateral and inferior-lateral wall. -LVEF= 48%	Positive	Acute myocarditis
Yaman et al., 2015[16]	15/M	Pulmonary edema/ heart failure	- ST depression in II, III, aVF, aVL and V3-V6	- EF=22% - Global hypokinesia - Rim of pericardial effusion	Positive	Reversible myopericarditis
Bucur et al., 2012[4]	35/M	Pulmonary edema/ heart failure	- Sinus tachycardia - Hyperacute T in V3-V6	- EF= 48% - Septal and lateral wall hypokinesia	Positive	Reversible myopericarditis
Levine et al., 2010[7]	22/M	Pulmonary edema	- Incomplete right bundle branch block - ST uptake in V1-V6	- EF= 35% - Mild to moderate tricuspid regurg	Positive	Reversible myopericarditis
Sari et al., 2008[10]	65/M	Chest pain	- ST elevation in II and aVF - Hyperacute T in V3-V6	- Normal	Positive	Kounis syndrome
Erdur et al., 2007[5]	22/M	Chest pain, severe hypertension	- Inverted P in leads II, III, aVF, aVL and V1	- EF = 40% - Anteroseptal wall hypokinesia	Positive	Reversible toxic myocarditis
Pneumatikos et al., 2003[8]	19/F	Cardiogenic shock	- Atrial fibrillation - Incomplete right bundle branch block	- EF = 20 % - Global hypokinesia	Positive	Acute fatal toxic myocarditis

Bucur et al., June 1988 to May 1997[3]	Seven cases (13-57 years)	Ranging from chest pain to pulmonary edema	- Not mentioned	- Not mentioned	Not mentioned	All cardiac events were reversible
Pulignano et al., 1998[9]	16/M	Typical chest pain	- ST-T changes in precordial leads	- Akinesia of interventricular septum - Depressed left ventricular function	Positive	Reversible toxic myocarditis

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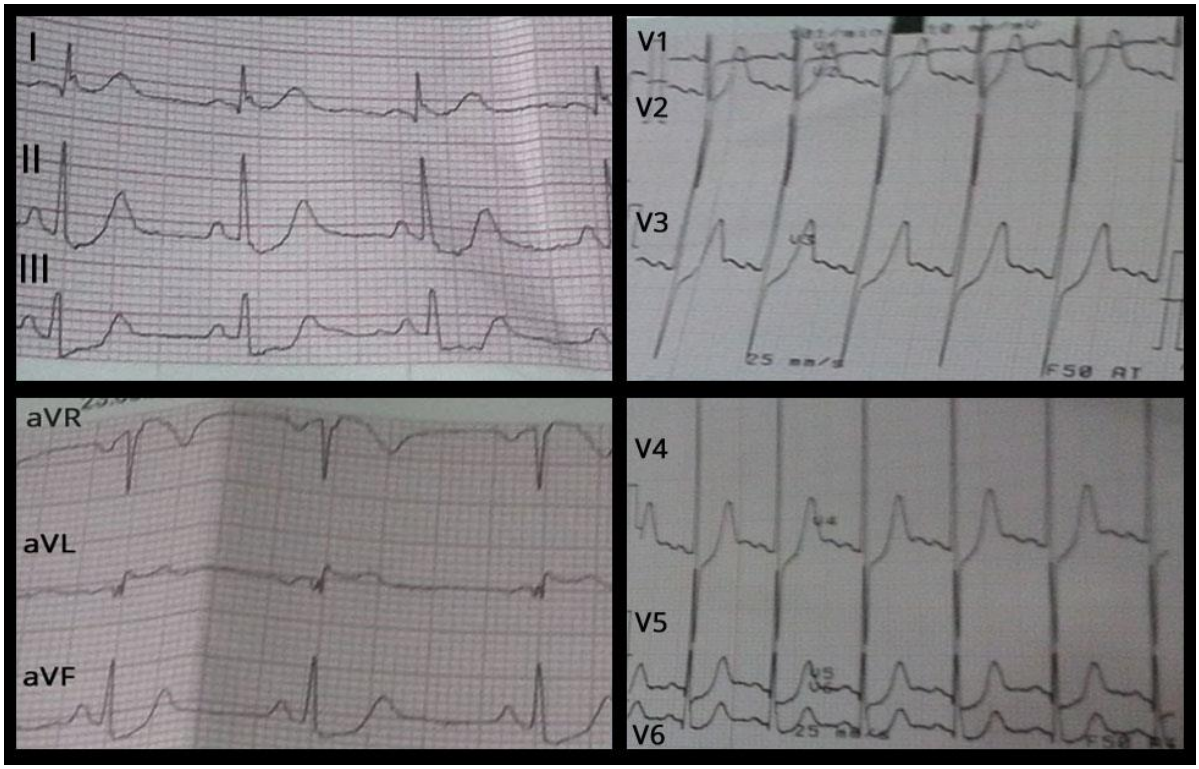
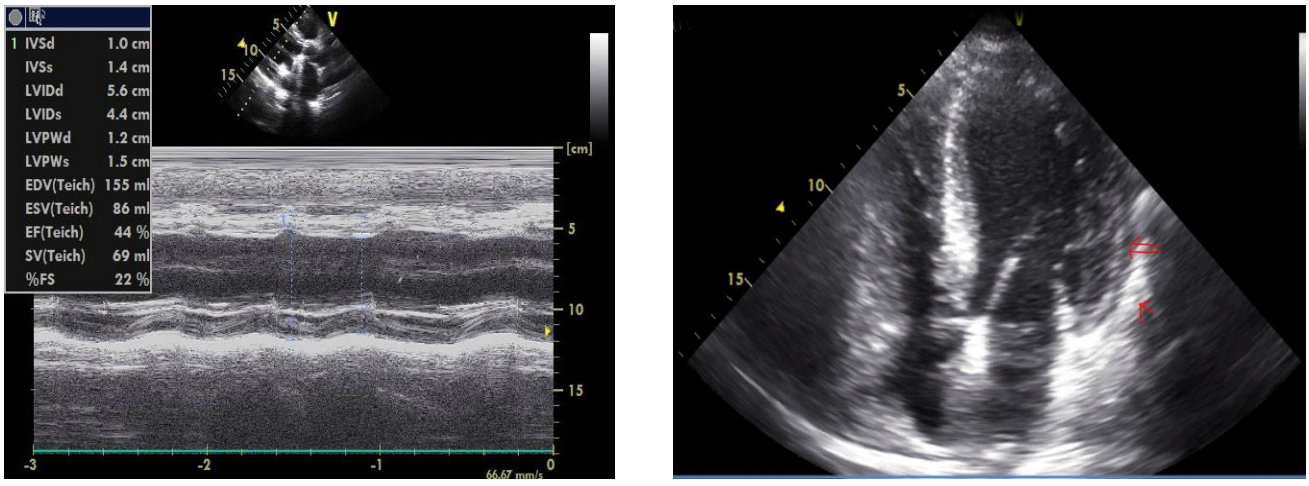


Figure 1: Initial electrocardiogram showing ST-segment elevation in leads I, aVL, and ST-segment depression in leads II, III, aVF, and V2–V6.



A **B**

Figure 2: (A) Echocardiography showing normal left ventricular end-diastolic diameter and impaired left ventricular systolic function with an ejection fraction (EF) of 42%. **(B)** Echocardiography showing thickening of the pericardium with rim of pericardial effusion on lateral wall and right atrium.