Sudden cardiac arrest and cerebral thrombosis due to bites by Russell's viper (Daboia siamensis)

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ABSTRACT
Russell’s viper bite is an important public health problem of tropical countries including Thailand. Common manifestations after Russell’s viper bite are local tissue swelling, coagulopathy, and nephrotoxicity. Cardiac manifestation and cerebral infarction rarely occur. Herein, we reported two cases of cardiac arrest with evidence of large vessel complication following Russell’s viper bite. The first case was a 52-year-old man who presented with cardiac arrest due to acute myocardial infarction. His coronary angiography result showed 95% stenosis of the mid left anterior descending artery and a drug-eluting stent was successfully placed. The second case was a 46-year-old female who developed cardiac arrest followed by an acute ischemic stroke. Antivenom was given and her symptom improved. We hypothesized that our patients developed a prothrombotic state associated with consumptive coagulopathy, causing large vessel thrombosis. The exact mechanism to explain these complications, however, is still inconclusive. Nonetheless, early recognition of these events and prompt treatment may reduce morbidity and mortality.

KEYWORDS
Russell’s viper; venom-induced consumption coagulopathy; myocardial infarction; cardiac arrest; cerebral thrombosis

Introduction
Clinical manifestations following Russell’s viper envenomation are usually local swelling, coagulopathy, nephrotoxicity and neurological complications [1]. Among neurological complications, ischemic stroke is uncommon [1, 2]. Cardiac involvement is a rare complication of snakebite [1, 3]. Hence, we present two cases with coronary occlusion and ischemic stroke due to bites by Daboia siamensis (Figure 1).

Cases detail
Patient 1
A 52-year-old man developed chest pain followed by pulseless electrical activity (PEA) 1.5 hour after being bitten by a Russell’s viper. An expert identified the killed snake specimen as D. siamensis. He had return of spontaneous circulation (ROSC) after 1-minute of cardiopulmonary resuscitation (CPR). Electrocardiogram (ECG) demonstrated ST elevation on V2-V6 leads (Figure 2(a)). He did not receive thrombolytic agents owing to risk of bleeding from snake envenomation. Ten minutes later, he developed ventricular fibrillation and underwent two further cycles of CPR. Troponin-I concentration was 3.3 pg/mL (<0.01). Echocardiography demonstrated anterior wall hypokinesia. He received five vials of monovalent antivenom for D. siamensis which were manufactured by Queen Saovabha Memorial Institute, Bangkok, Thailand since whole-blood clotting time (WBCT) result was >20 minutes suggesting envenomation. Platelet count was 119,000 cells/mm\textsuperscript{3} and prothrombin time (PT) and partial thromboplastin time (PTT) were also >180 seconds. Initial serum blood urea nitrogen (BUN) was 18 mg/dL (7.9–20) and creatinine was 1.38 mg/dL (0.5–0.8) without further rising. Coronary angiography revealed 50%-stenosis of proximal left anterior descending artery (LAD), 95%-stenosis of mid LAD, and 60%-stenosis of proximal left circumflex artery (Figure 2(b)). His ECG, elevated troponin, and abnormal coronary angiography confirmed acute ST-elevation myocardial infarction, and he underwent percutaneous coronary intervention with a drug-eluting stent. He received dual antiplatelet therapy for one year without further chest pain.
Patient 2

A previously healthy 46-year-old woman had PEA 2 hours after being bitten by a Russell’s viper which confirmed to be *D. siamensis* through a killed snake specimen. After 2-minutes CPR, she had ROSC but developed right hemiplegia. ECG showed normal findings. Computed tomography (CT) scan of the brain was normal at first. As WBCT was >20 minutes, she received five vials of polyvalent antivenom for hematotoxic snake from the same manufacturer as patient 1. PT and PTT were also >180 seconds, and D-dimer was >80,000 ng/mL (<550). Initial serum BUN was 26 mg/dL and creatinine was 0.89 mg/dL without further rising. Coagulopathy and risk of bleeding from the snake envenomation precluded thrombolysis. Clot retrieval was unavailable. Her hemiplegia completely improved one day later. She received additional antivenom due to continued prolonged WBCT. A day after, PT, PTT, and D-dimer returned normal. Repeated CT brain demonstrated hypodensity lesions at left parieto-occipital area, consistent with acute infarction (Figure 3). CT angiography showed no stenosis of visible intracranial arteries.

Discussion

Our cases had prolonged PT and PTT, decreased platelet count, prolonged WBCT, and elevated D-dimer (in the second case) indicating consumptive coagulopathy. Thus, we hypothesized that they had a prothrombotic state precipitating acute large vessel thrombosis in the coronary and cerebral circulation. In patient 1, pre-existing coronary lesions demonstrated by coronary angiography might make him more susceptible to acute coronary thrombosis. Despite an obvious consumptive coagulopathy picture, there was no evidence of severe end-organ damage causing by microthrombi or microangiopathy in our cases. The clinical appearance of disseminated vascular coagulation (DIC) without microangiopathy is consistent with venom-induced consumption coagulopathy (VICC) [4].

Previous literature demonstrated cases of large vessel occlusion following snakebite. For example, two reports [5, 6] of inferior ST-elevation myocardial infarction following *Daboia russelii* bite in Sri Lanka. Gaballa et al. described a 28-year-old man who had an acute myocardial infarction with thrombosis of the proximal LAD after a bite by his pet snake (species not reported) [3]. Gawarammana et al. described a case series of nine patients with acute ischemic stroke following bite by Russell’s viper [2]. Three other case
reports further documented acute ischemic strokes following Russell’s viper bite in Sri Lanka [7–9]. A 17-year-old woman developed both acute myocardial infarction and cerebral infarction following a bite by Vipera spp. in Greece [10].

In summary, large vessel complication in Russell’s viper bite is rare, but potentially fatal. VICC is likely the underlying mechanism of prothrombotic state in our cases. Given our resource limitations, we could not perform all coagulation tests in our hospital. Similarly, coronary angiography is generally available only in tertiary care centers. Nonetheless, patient monitoring, early detection of the conditions and prompt treatment may reduce morbidity and mortality.

Disclosure statement

No potential conflict of interest was reported by the authors.

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