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Case Report

Russell's Viper venom induced reverse takotsubo cardiomyopathy

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ABSTRACT

Reverse takotsubo cardiomyopathy is a rare variant of takotsubo cardiomyopathy characterized by basal akinesis/hypokinesis associated with apical hyperkinesis, with no evident obstructive coronary artery disease, which often resolves spontaneously. This condition was observed in a 15-year-old girl after being bitten by Russell's viper. She presented with pain and swelling at the bitten area. Further evaluation, showed elevated cardiac biomarkers, ECG showed ST-segment changes and echocardiographic findings of basal akinesis with preserved apical function. After receiving anti-snake venom and supportive care treatment, she fully recovered and her cardiac function returned to normal. This case emphasizes the significance of assessing the heart in situations of viper bites among patients.

Keywords: Reverse takotsubo Cardiomyopathy, Russel's viper

INTRODUCTION

Snake envenomation is a cause of high mortality and morbidity in the suburban and rural areas of the tropical and subtropical world. Of the 52 poisonous species in India, five species *Ophiophagus hannah* (king cobra), *Naja naja* (common cobra), *Daboia russelli* (Russell's viper), *Bungarus caeruleus* (krait), and *Echis carinatus* (saw-scaled viper)-account for majority of bites.[1-3] Snake venom is a complex mixture of proteins and enzymes.

Especially, viper venom contains a haemotoxin, a myotoxin, a cardiotoxin and a neurotoxin. Although localized tissue damage and coagulopathy are major concerns after envenomation, recent evidence has focused attention on the potential direct effects of venom on the cardiovascular system. Snakebite envenomation leads to cardiovascular disturbances, including hypotension, arrhythmias, cardiomyopathies and even acute myocardial infarction. Hypokinesis of the basal and middle segments of the LV wall with apical sparing is characteristic of reverse takotsubo cardiomyopathy. The interaction of systemic inflammation with venom has been studied in intricate detail, exploring its effects on the cardiovascular system. Venom-induced inflammation may directly cause cardiac damage.[4] In clinical practice, managing venom-induced cardiovascular complications requires intensive care, with early and vigilant monitoring being critical to improving patient outcomes.[5] We present the case of a 15-year-old girl who was bitten by a Russell's viper and developed reverse stress cardiomyopathy. She fully recovered after receiving polyvalent anti-snake venom therapy and other supportive treatments.

CASE REPORT

A 15-year-old female, with no comorbid conditions, presented with a history of Russell's viper bite on her left ankle that caused pain, bleeding, ecchymosis, and left inguinal lymphadenopathy. On admission, she was conscious, oriented, afebrile. Vitals BP-80/70 mm of Hg, HR-118 /min, SpO2-98% on room air, Respiratory rate- 28 /min. Patient also had painful left inguinal lymphadenopathy.

Examination revealed a bite mark with surrounding tenderness and local rise of temperature, minimal ecchymosis around the right eye and a hand hematoma, probably due to subtle trauma during transport to hospital. Investigations revealed neutrophilic leukocytosis (WBC:

34,600 cells/dl, neutrophils 75%), prolonged coagulation parameters (PT-INR >10, apTT>150 s), and elevated inflammatory markers. Troponin I was positive on presentation (164.4 ng/dl) peaking to 611.3 ng/dl. ECG showed diffuse ST depression and ECHO features of reverse takotsubo cardiomyopathy (hypokinetic basal LV segments). During the course of hospital stay her coagulation abnormalities and cardiac dysfunction normalized, repeat ECHO showed good biventricular function. The patient was diagnosed with a hemotoxic snake bite with systemic envenomation, coagulopathy, and reverse Takotsubo cardiomyopathy. Supportive care including anti-snake venom, inotropic support and the correction of her coagulopathy led to full recovery and she was discharged in a stable condition.

Figure 1: Bite mark over the foot.

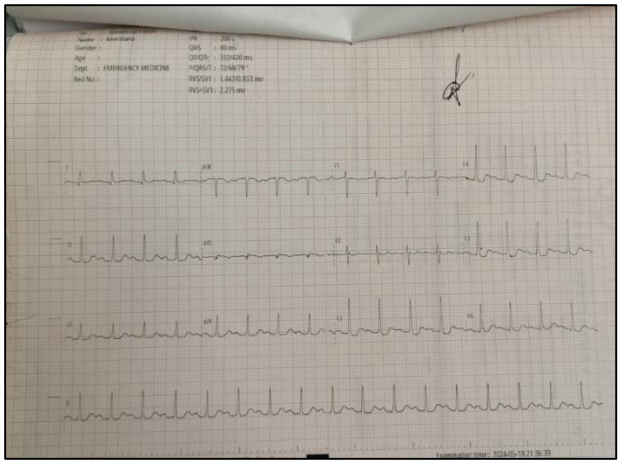

Figure 2: ECG showing diffuse ST depression.

Figure 3: ECHO showing reverse takotsubo cardiomyopathy.

DISCUSSION

This case of Russell's viper bite demonstrates the systemic complications of Viperidae envenomation, with a rare occurrence of reverse Takotsubo cardiomyopathy. It has been known that snakebite envenomation, especially by Russell's viper, results not only in local tissue damage but also systemic complications. While the immediate clinical focus tends to be on the local effects of the bite and coagulopathy, emerging research has increasingly

highlighted the direct impact of snake venom on the cardiovascular system. Sudden emotional stress along with the snake bite causes excessive sympathetic stimulation leading catecholamine-induced microvascular spasm or direct myocardial toxicity which is manifested as reverse takotsubo cardiomyopathy.[1,2] Cardiac manifestations are common in viper bites. The direct cardiotoxic effect of snake venom can result in myocarditis and extensive cardiac damage which underscores the need for awareness of these potentially life- threatening complications.[3,4]

Several research studies on the pathophysiology of these complications suggested that systemic inflammation due to snake venom was one of the critical factors associated with cardiovascular dysfunction. This type of inflammation often results in direct myocardial damage and, thus, acute myocardial infarction in some instances.[5] Large vessel complication in Viper bite is rare, but potentially fatal.[6] Furthermore, other studies indicate that snakebite envenomation is linked with myocarditis, which aggravates cardiac dysfunction and worsens the outcome for patients7. The interplay between inflammation caused by the venom and cardiac injury is therefore complex, necessitating timely diagnosis and management.

Management of cardiovascular complications due to venom requires immediate and intensive care, including early intervention and careful monitoring. The treatment of such patients was solely reliant upon the administration of polyvalent antivenom therapy and supportive treatments.[8,9] This case of reverse stress cardiomyopathy in a young girl after a Russell's viper bite exemplifies the

need for early comprehensive care and proper management, so that patients can completely recover, emphasizing the need for recognition of the full spectrum of complications that can arise from snake envenomation.[10]

CONCLUSION

This case highlights the uncommon cardiac condition that can arise following a viper bite, Reverse takotsubo cardiomyopathy. The pathophysiological mechanisms likely involve a combination of venom-induced catecholamine surge, systemic inflammation, and direct myocardial toxicity. Early recognition and appropriate management of Reverse takotsubo cardiomyopathy in the case of snakebite envenomation is critical to optimize patient outcomes. This report highlights the need for awareness among clinicians regarding the potential for such rare complications, as well as the importance of a multidisciplinary approach to provide timely and effective care.

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