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A case of Brugada phenocopy unmasked following giant Asian honey bee stings

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Abstract

This case report details a rare occurrence of Brugada phenocopy (type 1 Brugada electrocardiographic pattern) precipitated following giant Asian honey bee (*Apis dorsata*) stings in a previously healthy Sri Lankan male. The patient had an uneventful course. While similar ECG patterns can arise from non-genetic factors, Giant Asian honey bee sting as a causal factor is exceedingly unusual and unreported previously. This case adds to the spectrum of cardiac manifestations of Hymenopteran venom highlighting the requirement for close cardiac monitoring and clinical vigilance in these patients.

Key words: Brugada phenocopy, giant Asian honey bee, bee sting

Introduction

There are three main families under the order *Hymenoptera: Vespidae*, which includes hornets, wasps, and yellow jackets, *Apidae*, which includes honeybees and bumblebees, and *Formicidae*, the housing fire ants.(1) Among the several types of honey bees in Sri Lanka, the feral giant Asian honey bee (*Apis dorsata*) is the largest and accounts for around 90.7% of the clinically significant hymenopteran stings in the country.(1) *Apis dorsata* are around 20 mm long and have a stinger attached to their viscera. When disturbed, the bees attack anyone in vicinity leaving behind the barbed sting and the venom sac in the victim's skin.(2) They are widely distributed throughout the Indian subcontinent and oceanic Asian countries and are known to build large hives in open areas, often hanging from branches of large trees, rooftops, or rock caves (figure 1).(2) The venom of *Apis dorsata* contains vasoactive substances, proteases, amines, and enzymes which have vasoactive and thrombogenic effects.(3) These substances have been associated with severe health effects, including fatal anaphylaxis, myocardial infarction, bowel gangrene, acute limb ischemia, multiorgan failure, and microangiopathic hemolysis.(1-5)

Brugada phenocopy is distinct from the autosomal dominantly inherited Brugada syndrome (BrS). Both are characterised by typical ECG changes of ST segment elevations in leads V1-V3, which can manifest as "coved" (type 1) or "saddleback" (type 2) morphologies.(6,7) Brugada syndrome is commonly due to mutations in cardiac sodium channel gene SCN5A, and carry an increased risk of fatal ventricular arrhythmias, especially with fever, and thus require pacemaker or implantable cardioverter defibrillator therapy once identified. On the other hand, BrP is a transient, completely reversible, incidentally discovered electrocardiographic manifestation precipitated by non-genetic causes that alter the sodium concentration across the cardiomyocyte membrane.(8) There are several recognized secondary causes inducing BrP. This case highlights a rare occurrence, and first ever reported case of a Brugada phenocopy (BrP) developing following stings from feral giant Asian honey bees in a previously healthy young Sri Lankan male. It also adds to the spectrum of cardiac manifestations of Hymenopteran

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venom, highlighting the requirement for close cardiac monitoring and clinical vigilance in these patients.

Case presentation

A previously healthy, 22-year-old man, with no significant past medical, past atopy or family history of sudden cardiac deaths, presented to the emergency unit following around 8 giant Asian honey bee (Apis dorsata) stings on his scalp, face, neck, and limbs, stung while hiking in Kandy, Sri Lanka. At the hike site, he had immediately developed an extreme sense of dizziness, vertigo, vomiting followed by intense pain, itching and redness at the sting sites. He did not complain any abdominal pain, chest pain, palpitations, breathing difficulty, wheeze, or loose stools.On presentation, he appeared conscious but anxious, and the dorsum of his right hand was red, swollen, and had a visible sting apparatus attached. He had a regular pulse of 102 beats per minute, blood pressure of 140/80 mmHg, normal capillary refill time, and normal on-air saturation. Temperature was 36.4^{0}C. Cardiac and respiratory auscultation was unremarkable. The visually identified sting apparatus were carefully removed. Type 1 Brugada pattern was identified in the very first electrocardiograph (ECG) with the right precordial leads V1 and V2 placed at second intercostal space (figure 2A). Intravenous hydrocortisone (200 mg), chlorpheniramine (10 mg) and ondansetron (8 mg) were given, and he was transferred to a general medical unit, where a three day course of oral acetaminophen (1g as needed), prednisolone (10 mg thrice daily), chlorpheniramine (4 mg daily) and fexofenadine (180 mg daily) were continued. Hydration status was ensured. Table 1 summarises the other investigations. The ECG taken the following day confirmed the disappearance of the Brugada pattern (figure 2B). Transthoracic echocardiography revealed normal cardiac structure and function. A conservative approach was suggested by the cardiac electrophysiologist. With improvement of his general condition,resolution of the swelling of the hand, and with no further complications, he was subsequently discharged on the 3rd day with relevant health education regarding the ECG pattern.

Discussion

This case report delves into the intriguing relationship between giant Asian honey bee stings and the precipitation of BrP. The placement of the right precordial leads in a superior position (up to the second intercostal space above normal), as done in our patient, can increase the sensitivity of the ECG for detecting the Brugada phenotype.(9) The criteria for defining a BrP include the typical ECG pattern, the presence of an underlying identifiable condition, the resolution of the ECG pattern after correcting the underlying condition, a low probability of true BrS with no clinical history suggestive of sudden cardiac death in the past or in the family history, a negative provocative challenge with sodium channel blockers (ajmaline, procainamide, flecainide) and negative genetic tests for BrS.(7,8) Our patient fulfilled the first four criteria, and the provocative and genetic tests were not performed due to unavailability. With a normal temperature and no metabolic derangements

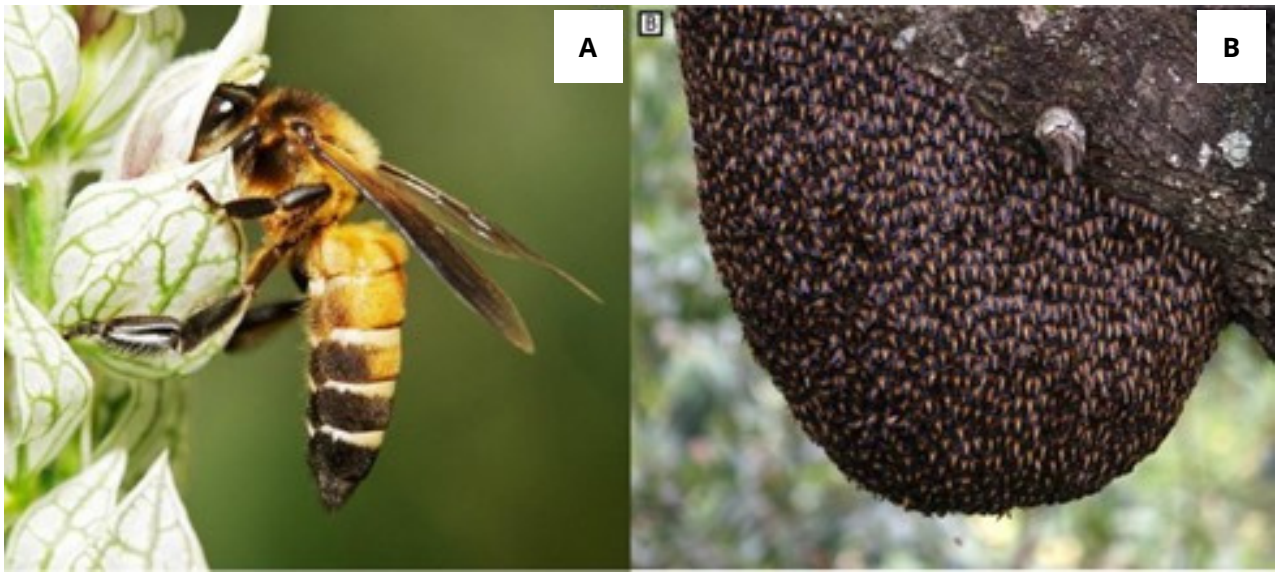

Figure 1 - **A**: giant Asian honey bee (*Apis dorsata*); **B**: hive of *Apis dorsata*

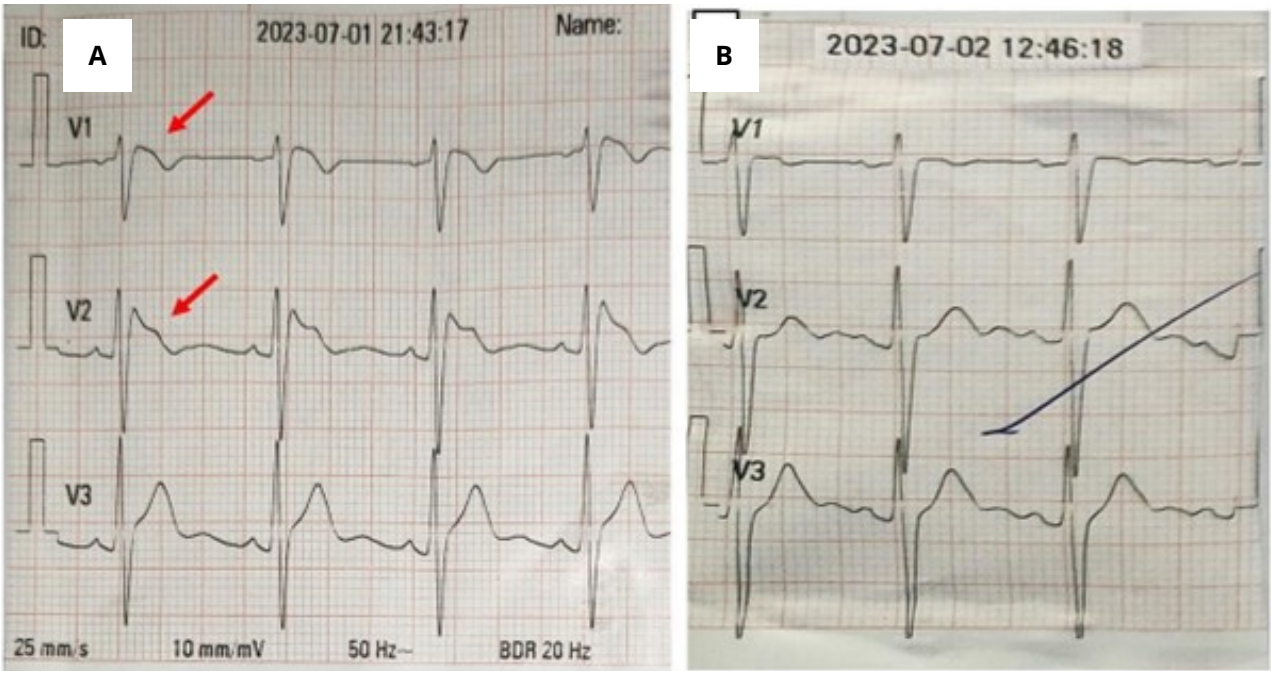

Figure 2 - **A**: Initial ECG, with arrows showing type 1 Brugada pattern;
B: the same leads in the subsequent ECG, taken 24 hours later, showing normal ECG

Table 1 - Summary of blood investigations

Investigation	Patient's value	Reference range
Total white blood cell count (x10^9/L)	13.94	4 – 10
Neutrophil count (x10^9/L)	9.2	2 – 7
Haemoglobin (g/dL)	15.7	11 – 16
Platelet count (x10^9/L)	313	150 - 450
Serum creatinine (µmol/L)	79.8	80 – 115
Serum sodium (mmol/L)	143	135 – 145
Serum potassium (mmol/L)	4	3.5 – 5.5
Serum magnesium (mmol/L)	0.9	0.85 – 1.1
Serum phosphate (mmol/L)	1.2	1.12 – 1.45
AST (U/L)	15	13 – 31
Troponin I	Negative	

identified, the most likely precipitant of our patient's BrP is the venom in the bee sting. Brugada phenocopy has no specific management, other than avoidance of precipitating factors and follow up. Recognition and appropriate management of patients with BrP will avoid unnecessary costly tests and treatments.

The association between giant Asian honey bee stings and BrP could be attributed to vasospasm of

coronary arteries due to myocardial ischemia, or toxin mediated transient inhibition of sodium channel activity with a predominant outward potassium current of cardiomyocytes. As this link remains poorly understood, we emphasise the need for further research into the specific mechanisms by which bee venom may induce this phenomenon. Monitoring patients for cardiac complications following bee stings and conducting research on the effects of bee venom on cardiac ion channels and vasculature are crucial, given the common occurrence of giant Asian honey bee stings in tropical regions worldwide.

Conclusion

This case provides a fascinating intersection of cardiology, toxicology, and environmental factors, demonstrating how giant Asian honey bee stings can precipitate Brugada phenocopy. It exemplifies the need for on admission ECG and cardiac monitoring. Also the effect of bee venom on cardiac ion channels and vasculature needs to undergo research as giant Asian honey bee stings are a common occurrence in tropical regions in the world.

Declarations

Author contributions
All authors were involved in the management of this patient

Conflicts of interest
No conflict of interest

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