

## Disappearing Brugada Patterns in Heat Stroke

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### ABSTRACT

Fever is known to unmask Brugada pattern on electrocardiogram. Close follow up of such cases is needed as Brugada syndrome can develop later. Herein we present a case in which Brugada pattern on electrocardiography was unmasked by heat stroke. Presence of both type 1 and type 2 Brugada patterns in heat stroke has not been reported.

**Key-words :** heat stroke, fever, Brugada.

### Introduction :

Brugada syndrome was first described in 1992 by Pedro and Joseph Brugada. It is a genetic channelopathy characterized by right bundle branch block and persistent precordial ST segment elevations on electrocardiography. It is associated with increased risk of sudden cardiac death. A prominent coved or saddle shaped ST elevation in leads V1-V3 without any identifiable cause is termed brugada pattern.<sup>1</sup> A coved type ST segment elevation  $\geq 2$  mm in the right precordial leads is termed as type I Brugada pattern. Different contours of ST segment elevation (saddleback) are termed type II or type III Brugada pattern.<sup>2</sup> Infection, fever, electrolyte disturbances, drugs or mechanical compression of the right ventricular outflow tract are known to be precipitants.

### Case Report :

A 52 years old male presented with high grade fever since 2 days in peak summer days. It was continuous and was associated with headache. He had altered sensorium since 1 day. He did not experience seizure, syncope or presyncope. There was history of exposure to hot weather (outdoor temperature of 45° Celsius). Past history was significant for diabetes mellitus.

On examination, he was having hyperpyrexia with temperature of 108 degree Fahrenheit (42 degree Celsius), pulse rate of 120/minute, blood pressure of 140/80 mmHg and saturation of 95% on room air. Cardiovascular system examination was normal. Respiratory system exam revealed normal air entry, with no adventitious sounds. Neurological examination revealed that patient was stuporais, did not respond to oral commands and responded to deep painful stimuli.

Pupils were constricted bilaterally. Limb examination revealed spasticity in all the limbs. Bilateral plantar reflexes were extensor. Rest of the neurological examination was within normal limits.

The diagnosis of heat stroke was strongly suspected but differential diagnosis of febrile encephalopathy, cerebrovascular episode and meningitis were considered and the patient was investigated accordingly.

CT scan of brain showed no abnormalities. Complete blood count, serum electrolytes, cerebrospinal fluid studies, urine examination, chest X ray and echocardiography were within normal limits. Random blood sugar was 172 mg/dl. Total creatine phosphokinase was elevated 6676U/L (reference 25-170 U/L).

On admission electrocardiogram (ECG) revealed ST segment elevations in leads V1, V2 and V3 suggesting type 1 Brugada pattern (**Figure 1**). The patient was treated with vigorous cold sponging, intragastric cold saline for rapid temperature control, antibiotic intravenous ceftriaxone, aspirin, pantoprazole and intravenous fluids. His fever

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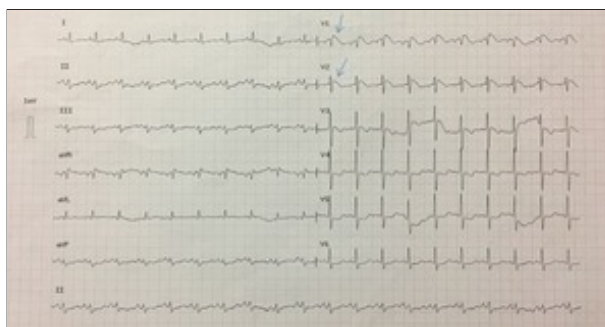
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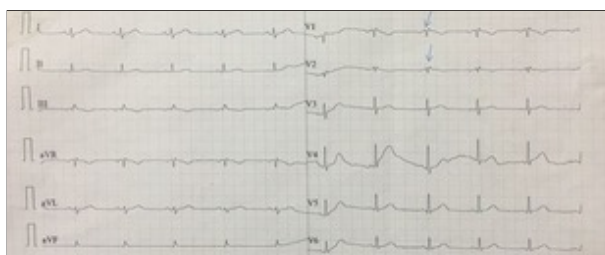
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**Figure 1 :** 12 Lead Electrocardiogram showing type 1 Brugada pattern in leads V1 and V2 (blue arrows)



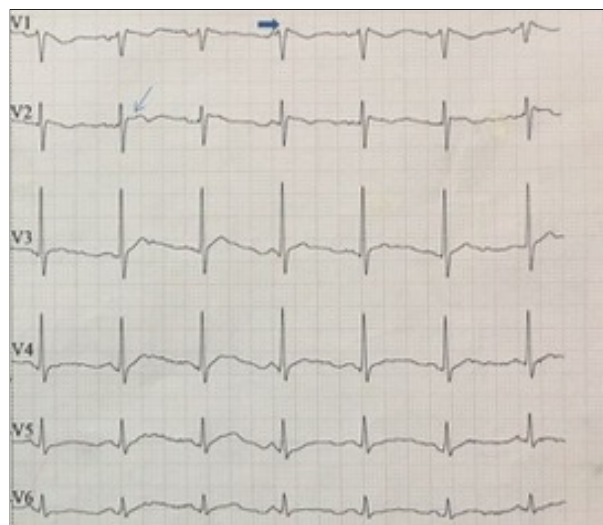
**Figure 3 :** 12 Lead Electrocardiogram showing right bundle branch morphology (blue arrow)

responded very dramatically to cold sponging and intragastric cold saline. Neurologic dysfunction gradually improved. He started responding to commands but needed assistance in walking.

Serial ECGs were recorded. At a temperature of 100 degree Fahrenheit (37.7 degree Celsius), ECG showed type 2 Brugada pattern and right bundle branch block like morphology (**Figure 2**). At 99 degree Fahrenheit (37.2 degree Celsius), ECG showed features of right bundle branch block (**Figure 3**). He was discharged on 14th day with oral drugs. He was advised to avoid heat exposure and keep a close follow up.

#### **Discussion :**

Fever induced Brugada pattern describes the changes in ECG during febrile episodes in susceptible individuals. A study conducted by Adler A et al reported the prevalence of type I Brugada pattern to be 20 times higher among patients presenting with fever as compared to afebrile patients.<sup>3</sup> Fever is reported to accentuate Brugada pattern on ECG as well as trigger ventricular arrhythmias in patients with Brugada syndrome.<sup>4</sup>



**Figure 2 :** Electrocardiogram showing type 2 Brugada pattern in leads V2 (single arrow) and right bundle branch like morphology in V1 (double arrow)

Multiple theories have been proposed to explain the mechanism of fever induced Brugada syndrome. Dumaine et al demonstrated worsening of the mutated sodium channels at higher temperatures.<sup>5</sup> However, Keller et al demonstrated that in patients with fever induced type I Brugada pattern, the mutated channels had loss of sodium function at physiological temperature.<sup>6</sup> The effect of temperature on sodium channels is responsible for fever induced arrhythmias. However in our patient, fever induced Brugada pattern was an incidental finding and resolved as fever subsided. But it is important to closely follow these patients as fever induced Brugada syndrome can develop.

#### **Conclusion :**

That raised environmental temperature is associated with various heat related syndromes ranging from heat exhaustion to fatal heat strokes is well established. But there are only few published cases showing manifest Brugada pattern on ECG during heat stroke. Our institute's geographical location is in the region of strong summers, with heat waves occurring almost every year, especially in the month of April, May and early June. This is a unique case where in for the first time, both patterns of Brugada were documented in a case of heat stroke.

Considering that Brugada pattern is associated with fatal ventricular arrhythmias, physicians should be made aware and vigilant in monitoring ECG and the rhythm in patients presenting with heat related syndromes so that delays are avoided in prompt treatment.

**Declaration of Interest :**

None

**Consent :**

Written informed consent was obtained from patient's legal guardian.

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