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Case Report

An Electrocardiographic Triple Rhythm Of Sinus Arrhythmia, Brugada Syndrome, And Early Repolarization With A Diverse Outcome

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Abstract

Rationale: Physicians can find several rhythms in the same electrocardiogram. Verification for each rhythm is very important for management. Patient concerns: A 22-year-old single Egyptian male student patient presented with recurrent palpitations. Snoring and familial sudden death were predominant. Diagnosis: The triple rhythm of sinus arrhythmia, type II Brugada syndrome, and early repolarization pattern. Interventions: Electrocardiography and echocardiography. Outcomes: Physiological, serious, and more serious are more suggested serially outcomes in each rhythm. Lessons: Rhythm differentiation will be essential for the clinician and cardiologist for the right management.

Keywords: Electrocardiographic triple rhythm, sinus arrhythmia, Brugada syndrome, early repolarization pattern, variable outcome

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Abbreviations

BrS: Brugada syndrome

CBC: Complete blood count

ECG: Electrocardiogram

ICD: Implantable cardioverter-defibrillator

KFT: Kidney Function Test

LFT: Liver function tests

NSR: Normal sinus rhythm

SA: Sinus arrhythmia

SAN: Sinus node

SCD: Sudden cardiac death

1. Introduction

Normal sinus rhythm (NSR) is the rhythm that origins from the sinus node (SAN) and identify the known rhythm of the healthy heart[1]. The rate in NSR is commonly regular. But it varies depending on autonomic inputs into the SAN. When there is an irregularity in the sinus rate, it is termed sinus arrhythmia (SA) [1]. Sinus arrhythmia is a common change in the NSR[2,3]. Sinus rhythm with a beat-to-beat variation in the P-P interval (the time between successive P waves), producing an irregular ventricular rate[4]. Sinus arrhythmia characteristically presents with an irregular rate in which the variation in the R-R interval greater than 0.12 seconds[2] or the P-P-interval of more than 120 ms (3 small boxes)[3-5]. There should be a 10% difference between the maximum and minimum cardiac cycle length[6]. The P-P interval gradually lengthens and shortens cyclically, usually corresponding to the phases of the respiratory cycle[5] with normal sinus P-waves with both constant morphology[3, 4] and P-R interval[3,4] Sinus arrhythmia is a physiological condition that most commonly occurs in the young healthy adults [2,4] and children[2]. Sinus arrhythmia is a common incidental sign seen on routine Electrocardiogram (ECG)[2]. Often an asymptomatic and normal finding, the evaluation of sinus arrhythmia is limited. Generally, SA is at most mildly symptomatic (e.g., palpitations)[5]. Typically **its presence is a prognostic indicator for good cardiovascular health**[2,3]. Loss of SA may **indicate underlying heart failure or structural heart disease**[2].

Brugada syndrome (BrS) is a genetic disorder in which the electrical activity within the heart is abnormal[7]. The syndrome initially described by the Spanish cardiologists Pedro and Josep Brugada in 1992[8,9]. The prevalence of this syndrome is 0.01%-0.3%[7]. Brugada syndrome is an inherited syndrome accompanied by the risk of ventricular fibrillation (VF) and sudden cardiac death (SCD) in a structurally normal heart[9]. It is more common in males and the highest among regions and ethnicities of Southeast Asian descent[10]. The onset of presentation is often in young adult[7,8]. It increases the risk of abnormal heart rhythms and SCD[7]. However, BrS is responsible for 4-12% of all SCDs and ~20% of SCDs in patients with no structural heart disease[7]. The frequently implicated gene is SCN5A which encodes the cardiac sodium channel[9]. There are three ECG classes of Brugada syndrome:

- **Class I** (coved type): It has a coved type ST-segment elevation with ≥ 2 mm (0.2 mV) J-point elevation and a gradually descending ST-segment followed by a negative T-wave[9,11].
- **Class II** (saddle-back type): It has a saddle-back pattern with ≥ 2 mm J-point elevation and at least 1 mm ST-segment elevation with a positive or biphasic T-wave. Class II pattern can occasionally be seen in healthy subjects[9,11].
- **Class III**: It has either a coved (class I-like) or a saddle-back (class II-like) pattern, with < 2 mm J-point elevation and less than 1 mm S-segment T elevation.

Diagnosis is typically based on ECG, however, the abnormalities may not be consistently present[7,9]. Drugs-like ajmaline is often used to detect the ECG changes[7]. The treatment of BrS is still challenging. There is no cure for Brugada syndrome[9]. Those at higher risk of SCD may be treated using an implantable cardioverter-defibrillator (ICD)[8]. ICD is the most widely accepted approach to therapy[8].

The term early repolarization has been in use for more than 50 years[12]. Over the last decades, an early repolarization pattern had been considered as a benign finding, it is frequently observed on surface ECGs, characterized by J-point and ST-segment elevation ≥ 2 contiguous leads[13]. The definition of ER has evolved. It was defined by Wasserburger[14] in 1961 as an elevated take-off of the ST-segment at the end of the QRS (the J-junction) with the downward concavity of the ST-segment and symmetrical T-waves seen particularly in the lateral ECG leads. The presence of J-waves and ST-segment elevation on the ECG, jointly termed "the early repolarization pattern," was harmoniously considered a benign finding devoid of clinical significance[15]. More recently, the early

repolarization pattern has increasingly attracted attention as it has been reported as a risk to **idiopathic VF and SCD** in case-control studies, characterized as early repolarization syndrome[13].

2. Case presentation

A 22-year-old single Egyptian male student patient presented to the physician outpatient clinic for consultation for recurrent palpitations. The patient had a history of recurrent palpitations and night snoring. Sudden death was common in the family. Upon examination; BP of 120/70 mmHg, the pulse of 72 bpm irregular, the temperature of 36.4 °C, O2 saturation using pulse oximetry of 99%. No more relevant clinical data were noted during a clinical examination. ECG showing R ECG tracing showing R-R interval variation with irregular ventricular rate:72 bpm, saddle shape ST-segment elevations in V1-2 leads, and ST-segment elevations in V3-5 leads at J-point. **(Figure 1)**. All investigations; electrolytes profile, troponin test, thyroid function tests, CBC, LFT, and KFT were normal. No detected abnormities on echocardiography. Genetic counseling was advised. Reassurance was the management.

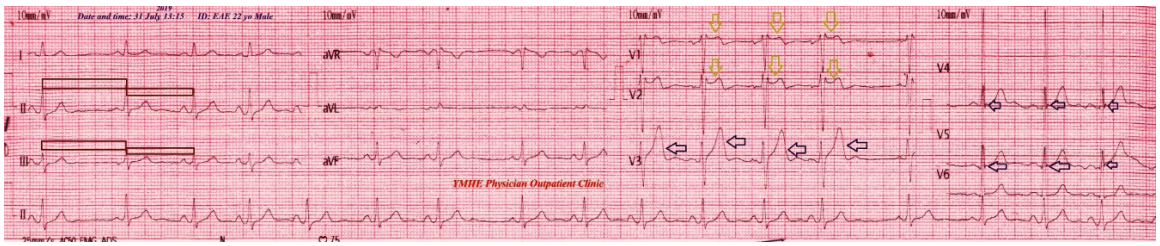

Figure 1: ECG tracing showing irregular R-R interval (brown rectangles) with ventricular rate:72 bpm, saddle shape ST-segment elevations in V1-2 leads (lemon arrows), and ST-segment elevations in V3-5 leads at J-point (black arrows).

3. Discussion

- **Overview:**
  - A young single male patient presented with recurrent palpitations. Snoring and familial sudden death were predominant.
- **Method of study**
  - My study was an observational retrospective case report.
- I can't **compare** the current case with similar conditions. There are no similar or known cases with the same management for near comparison.
- **The primary objective** for my case study was the presence of sinus arrhythmia, type II Brugada syndrome, and early repolarization pattern
- **The secondary objective** for my case study was the spontaneous question; How the physician deal with each one of the above rhythm?
- **Limitations of the study:**
  - There are no known limitations to the study.
- **Recommendations**
  - It is recommended for the physicians to clearing the effect of each one of the above rhythm on the patient.

4. Conclusions

- Rhythm differentiation will be essential for the clinician and cardiologist for the right management.

Conflicts of interest

There are no conflicts of interest.

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