

Reversible Type 1 Brugada Pattern Induced by Mild Hypokalemia

Robert Libera DO¹, Devi Parvathy Jyothi Ramachandran Nair MD¹, Ayushi Lalwani MD¹, Hamza Hafeez MD², Julian Diaz Fraga MD²
1 Tower Health Reading Hospital: Department of Internal Medicine
2 Tower Health Reading Hospital: Department of Cardiology

Introduction

First described in 1992, Brugada Syndrome (BrS) has been well documented with signature features on electrocardiogram (ECG) and an association with sudden cardiac death (SCD).¹ Recognizing the Brugada pattern on the (ECG) is imperative for identifying individuals at high risk of sudden cardiac death who may have BrS. Several exogenous factors can induce a Brugada pattern ECG, including hypokalemia. We report the case of a 33-year-old male patient who presented with mild hypokalemia and a reversible type 1 Brugada pattern on ECG.

Case Description

A 33-year-old male of Puerto Rican descent with a past medical history significant for human immunodeficiency virus (HIV) and chronic diarrhea presented to the emergency department for evaluation of worsening diarrhea.

When the patient presented to the hospital, he was afebrile and hemodynamically stable. Notable laboratory investigations revealed potassium 3.1 mEq/L, sodium 132 mmol/L, chronic pancytopenia, troponin less than 0.03 ng/mL, sedimentation rate 68 mm/hr, C-reactive protein 20 mg/L. Stool studies revealed multiple infectious pathogens including enteropathogenic *E. coli*, *Norovirus*, *Shigella/Enteroinvasive E. coli*.

ECG was obtained in the ED for evaluation of abdominal pain. Patient's initial ECG revealed coved ST elevation and T-wave inversions in leads V1 and V2 (Figure 1). Following replacement, his potassium improved to 3.5 mEq/L at which time a second ECG was obtained (Figure 2). Cardiology service was consulted for an abnormal ECG. The patient denied any history of chest pain, palpitations, exertional dyspnea, or syncope. The patient described a concerning family history including a brother who reportedly died of cardiac causes at age 44.

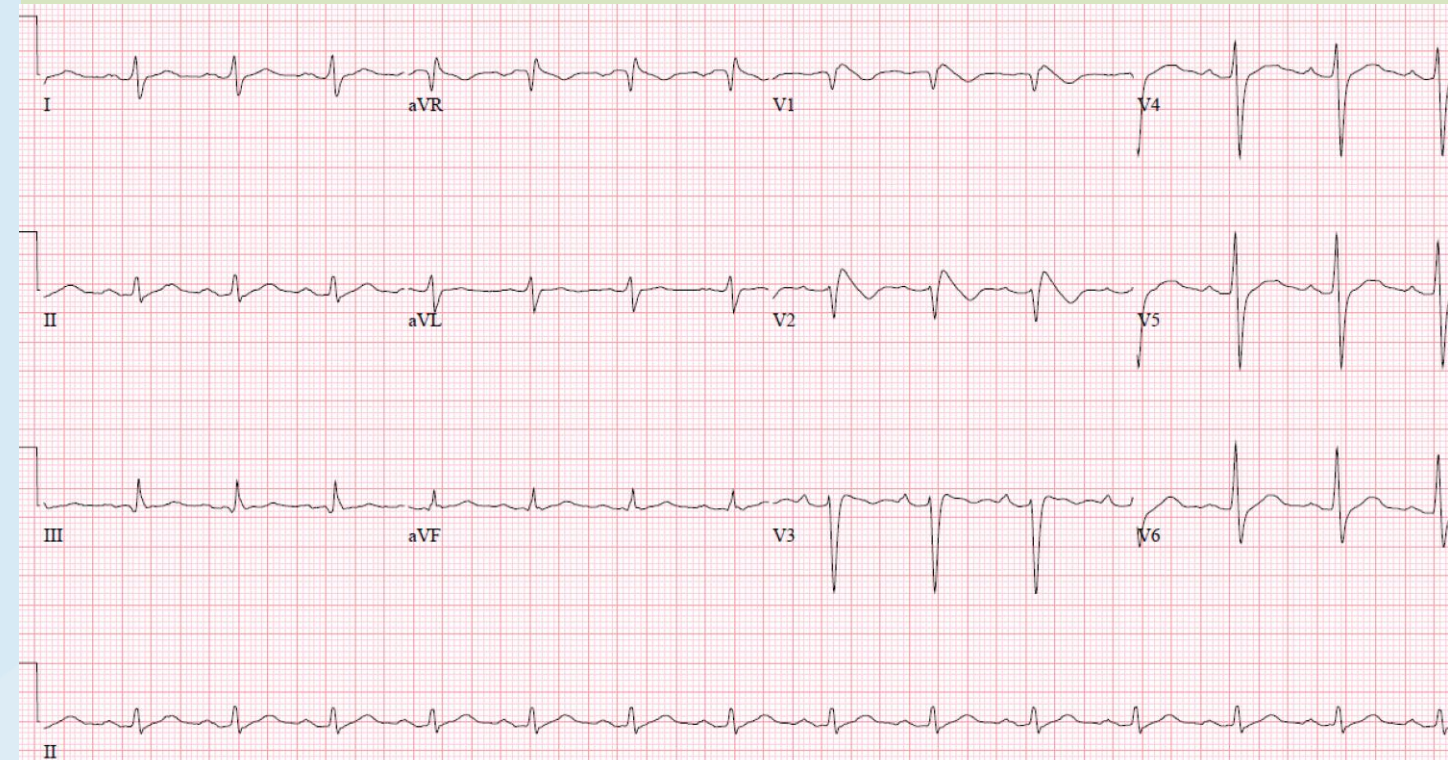


Figure 1. ECG demonstrating type 1 Brugada pattern in the setting of hypokalemia, potassium level of **3.1** mEq/L.

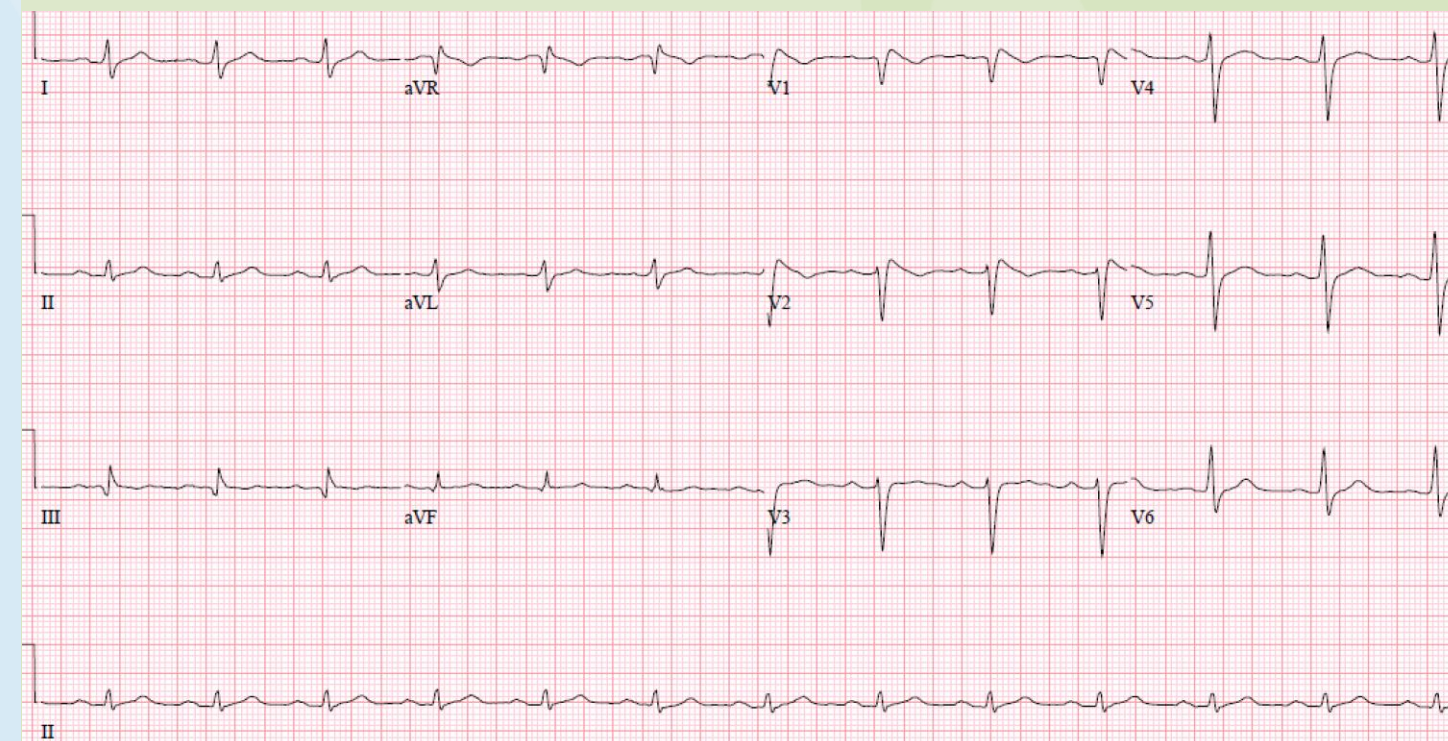


Figure 2. ECG demonstrating improvement of type 1 Brugada pattern after potassium replacement with serum level **3.5** mEq/L.

Discussion

This case provides support for hypokalemia as an inducer of a type 1 Brugada pattern on ECG. Hypokalemia has been described in several reports to serve as a substrate for the Brugada pattern. Potassium levels at which the Brugada pattern was revealed ranged from 1.5 mEq/L- 2.9 mEq/L.²⁻⁵ The exact threshold of hypokalemia for inducing the Brugada pattern is unclear. Our report demonstrates a mild threshold of hypokalemia, 3.1 mEq/L, which induced a type 1 Brugada pattern on ECG. Cardiology advised outpatient follow up for consideration of genetic testing or pharmacologic testing to assess for Brugada syndrome.

Key Points

- *Hypokalemia can induce the Brugada pattern on ECG*
- *While hypokalemia is a known precipitant of brugada pattern, this case reports a lower threshold of hypokalemia than previously known, 3.1 mEq/L*
- *Physicians may engage in shared decision making with patients to pursue further testing for Brugada syndrome when confronted with a Brugada pattern ECG*

References:

1. Antzelevitch, Charles et al. "Brugada syndrome: report of the second consensus conference: endorsed by the Heart Rhythm Society and the European Heart Rhythm Association." *Circulation* vol. 111,5 (2005): 659-70. doi:10.1161/01.CIR.0000152479.54298.51
2. Swe T, Dogar MH. Type 1 Brugada pattern electrocardiogram induced by hypokalemia. *J Family Med Prim Care*. 2016;5(3):709-711. doi:10.4103/2249-4863.197295
3. Genaro NR, Anselm DD, Cervino N, et al. Brugada phenocopy clinical reproducibility demonstrated by recurrent hypokalemia. *Ann Noninvasive Electrocardiol*. 2014;19(4):387-390. doi:10.1111/anec.12101
4. Notarstefano P, Pratola C, Toselli T, Ferrari R. Atrial fibrillation and recurrent ventricular fibrillation during hypokalemia in Brugada syndrome. *Pacing Clin Electrophysiol*. 2005;28(12):1350-1353. doi:10.1111/j.1540-8159.2005.00277.x
5. Nakashima T, Nagase M, Shibahara T, et al. True Brugada syndrome ECG or Brugada phenocopy ECG? Can the ECG itself tell us the diagnosis?. *J Electrocardiol*. 2022;73:59-61. doi:10.1016/j.jelectrocard.2022.05.009