

LETTER TO THE EDITOR

Brugada Phenocopy: Morphological Classification and Importance of Provocative Testing

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Brugada Phenocopy; Brugada Syndrome; Heroin; Ethanol

Dear Editor,

We read the excellent case report by Rambod et al.¹ regarding Brugada phenocopy (BrP) in the context of concomitant heroin and ethanol overdose with great interest. This case is important as it contributes to the growing body of literature describing BrP;^{2–6} however, there are salient points that require further discussion and investigation.

We have recently developed a *morphological* classification system which divides BrP into a type 1 and type 2 BrP according to the manifested ECG pattern. The type 1 BrP is identical to a *coved* or type 1 Brugada ECG pattern and the type 2 BrP is identical to a *saddleback* or type 2 Brugada ECG pattern.^{3,5,6} These two categories include A, B, and C qualifiers (Table 1). *Class A* includes BrP that have met all mandatory diagnostic criteria including negative provocative challenge with a sodium channel blocker. *Class B* includes highly suspected BrP; however, not all mandatory diagnostic criteria are complete. These are cases where mandatory provocative challenge is not possible due to various factors such as the patient being deceased or lost to follow-up. *Class C* includes highly suspected BrP; however, provocative testing is not justified such as in cases with recent surgical right ventricular outflow tract manipulation⁷ or BrP secondary to inappropriate ECG high pass filters.⁸

This case¹ qualifies as a type 1B BrP since provocative testing with a sodium channel blocker has not been completed. The authors¹ do acknowledge this as a weakness in their report; however, we strongly encourage them to contact the patient if possible to pursue a provocative challenge. We suggest this because the ECG prior to discharge has not completely normalized; there are still concerning ST-segment abnormalities in V₁–V₂ which may only represent displacement of the electrodes to a higher intercostal space;⁹ however, this warrants further investigation. Should a provocative challenge be positive, this patient would likely have true congenital Brugada syndrome (BrS) and need risk stratification for primary prevention of sudden cardiac death. Should the provocative challenge be negative, then we can include this case as a type 1A BrP in our recently launched international registry (www.brugadaphenocopy.com).

We would like to highlight important aspects of the provocative challenge with a sodium channel blocker. In true congenital BrS, sodium channel dysfunction is *unmasked* with a sodium channel blocker such as ajmaline, procainamide, or flecainide thereby manifesting as a type 1 Brugada ECG pattern.¹⁰ In BrP, sodium channel blockers have no impact on the resting ECG suggesting normal sodium channel function (or not reproducible in a controlled environment).

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Table 1. Brugada Phenocopy Classification System

Type	
Type 1 BrP	Brugada phenocopy with a typical type 1 Brugada ECG morphology
Type 2 BrP	Brugada phenocopy with a typical type 2 Brugada ECG morphology
Class	
Class A	All mandatory BrP diagnostic criteria are satisfied including provocative challenge with a sodium channel blocker such as ajmaline, flecainide, or procainamide
Class B	Highly suspected BrP; however, not all mandatory criteria are complete
Class C	Highly suspected BrP; however, mandatory provocative challenge with a sodium channel blocker not justified

Postema et al.¹¹ developed a database of drugs to avoid in BrS and, in a previous publication,² two groups of agents known to unmask the type 1 Brugada ECG pattern were discussed. Group 1 is composed of drugs that result in sodium channel blockade thereby augmenting the ST-segment elevation in leads V₁-V₃ thus producing a type 1 Brugada ECG pattern. These drugs may be associated with malignant arrhythmias in BrS. Group 2 is composed of drugs that are either known or believed to have sodium channel blocking effects. These drugs do not have a clear risk of inducing arrhythmias in BrS but are preferably avoided in these patients.^{2,11} The authors¹ describe sodium channel blockers and psychotropic drugs as agents that can *cause* BrP, and we would like

to further clarify this issue. By virtue of their mechanism of action, sodium channel blocking agents do not cause BrP; rather, they unmask sodium channel dysfunction in the setting of possible BrS.²

We thank Rambod et al.¹ for their use of this new Brugada Phenocopy terminology and recommend application of our systematic diagnostic criteria^{5,6} in the future for suspected cases of BrP.

REFERENCES

- Rambod M, Elhanafi S, Mukherjee D. Brugada phenocopy in concomitant ethanol and heroin overdose. *Ann Noninvasive Electrocardiol* 2014 Jun 5 [Epub ahead of print].
- Baranchuk A, Nguyen T, Ryu MH, et al. Brugada phenocopy: New terminology and proposed classification. *Ann Noninvasive Electrocardiol* 2012;17:299-314.
- Anselm DD, Baranchuk A. Brugada phenocopy: Redefinition and updated classification. *Am J Cardiol* 2013;111:453.
- Awad SF, Barbosa-Barros R, de Sousa Belem L, et al. Brugada phenocopy in a patient with pectus excavatum: Systematic review of the ECG manifestations associated with pectus excavatum. *Ann Noninvasive Electrocardiol* 2013;18:415-420.
- Anselm DD, Evans JM, Baranchuk A. Brugada phenocopy: A new electrocardiogram phenomenon. *World J Cardiol* 2014;6:81-86.
- Anselm D, Baranchuk A. Confirmed Brugada phenocopy in the setting of hypopituitarism. *Herz* 2014 Apr 11 [Epub ahead of print].
- Anselm DD, Perez-Riera AR, Femenia F, et al. Brugada phenocopy in a patient with surgically repaired pentalogy of Fallot. *Revista Iberoamericana de Arritmologia* 2012;3:20-24.
- Garcia-Niebla J, Serra-Autonell G, Bayes de Luna A. Brugada syndrome electrocardiographic pattern as a result of improper application of a high pass filter. *Am J Cardiol* 2012;110:318-320.
- García-Niebla J, Baranchuk A, de Luna AB. True Brugada pattern or only high V1-V2 electrode placement? *J Electrocardiol* 2014;47:756-758.
- Bayés de Luna A, Brugada J, Baranchuk A, et al. Current electrocardiographic criteria for diagnosis of Brugada pattern: A consensus report. *J Electrocardiol* 2012;45:433-442.
- Postema PG, Wolpert C, Amin AS, et al. Drugs and Brugada syndrome patients: Review of the literature, recommendations, and an up-to-date website (www.brugadadrugs.org). *Heart Rhythm* 2009;6:1335-1341.