



### A 3-D ELECTROPHYSIOLOGICAL COMPUTED MODEL OF ST SEGMENT ABNORMALITIES IN TYPE 1 BRUGADA PATTERN: THE KEY ROLE OF RVOT ORIENTATION IN THE THORAX





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#### Right Bundle Branch Block, Persistent ST Segment Elevation and Sudden Cardiac Death: A Distinct Clinical and Electrocardiographic Syndrome

A Multicenter Report

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Objectives. The objectives of this study were to present data on whom ventricular biopsies were performed. The arrhythmia

Methods. The study group consisted of eight patients, six male and two female, with recurrent episodes of aborted sudden death.

*Results*. The ECG during sinus rhythm showed right bundle branch block, normal QT interval and persistent ST segment elevation in precordial leads  $V_1$  to  $V_2-V_3$  not explainable by electrolyte disturbances, ischemia or structural heart disease.

elevation in precordial leads V<sub>1</sub> to V<sub>2</sub>-V<sub>3</sub> not explainable by electrolyte disturbances, ischemia or structural heart disease. No histologic abnormalities were found in the four patients in unknown.

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#### Current electrocardiographic criteria for diagnosis of Brugada pattern: a consensus report

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### ST Segment Depression in the Inferior Leads in Brugada Pattern: A New Sign

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# V2 high ics



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Prevention of Ventricular Fibrillation Episodes in Brugada Syndrome by Catheter Ablation Over the Anterior Right Ventricular Outflow Tract Epicardium Koonlawee Nademanee, Gumpanart Veerakul, Pakorn Chandanamattha, Lertlak Chaothawee, Aekarach Ariyachaipanich, Kriengkrai Jirasinrojanakorn, Khanchit Likittanasombat, Kiertijai Bhuripanyo and Tachapong Ngarmukos

Circulation: 2011;123:1270-1279; originally published online March 14, 2011; doi: 10.1161/CIRCULATIONAHA.110.972612 Circulation is published by the American Heart Association, 7272 Greenvalle Avenue, Dallas, TX 75231 Copyright © 2011 American Heart Association, Inc. All rights reserved. Print ISSN: 0009-7322, Online ISSN: 1524-4539







# ANTZELEVITCH'S THEORY



**Reduction of function of Sodium Channel** 

#### A comprehensive electrocardiographic, molecular, and echocardiographic study of Brugada syndrome: Validation of the 2013 diagnostic criteria



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**EACKGROUND** The debate on the diagnostic value of high intercostal spaces (3CSs) and of the number of diagnostic leads in Brugada syndrome (BrS) has been settled by a recent expert consensus statement.

OBJECTIVE To test the validity, and the underlying anatomy, of the new electrocardiographic (ECG) diagnostic criteria using echocardiographic, molecular, and clinical evidence in 1 clinical study population with BrS.

METHOD5 We analyzed 114 patients with BrS and with a spontaneous or drug-induced type 1 ECG pattern recorded in 1 or more right precordial leads in fourth, third, and second ICSs. The right ventricular outflow tract (RVOT) was localized by using echocardiography. All probands were screened on the SCNSA gene.

**RESULTS** The percentage of mutation carriers (MCs) and the event rate were similar regardless of the diagnostic ICS (fourth vs high ICSs: MCs 23% vs 19%; event rate 22% vs 28%) and the number of diagnostic leads (1 vs  $\geq$ 2; MCs 20% vs 22%; event rate 22% vs 27%). The concordance between RV01 anatomical location and the diagnostic ICSs was 86%. The percentage of the diagnostic ICG pattern recorded was significantly increased by the exploration of the ICSs showing RVOT by echocardiography (echocardiography-guided approach vs conventional approach 100% vs 43%; P < .001).

CONCLUSION The high ICSs are not inferior to the standard fourth ICS for the ECG diagnosis of BrS, and the interindividual variability depends on the anatomical location of the RV0T as assessed by using echocardiography. This approach significantly increases diagnostic sensitivity without decreasing specificity and fully supports the recently published new diagnostic criteria.

KEYWORDS Brugada syndrome: Electrocardiography: Echocardiography: Diagnostic criteria; SCNSA

ABBREVIATIONS BrS = Brogada syndrome; ECG = electrocardiogram/electrocardiographic; FM = family member; BCS = intercostal space; MC = mutation carrier; RVOF = right ventricular outflow tract

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#### Potential applications of the new ECGSIM

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Abstract This contribution demonstrates some applications of the most recent release of ECGSIM, an interactive simulation program that enables the user to study the relationship between the electric current sources of the heart and the resulting electrocardiographic signals on the body surface as well as those on the surface of the heart. It aims to serve as an educational tool as well as a research tool. The examples are drawn from the topics discussed by the participants of the Magnetic Anatomic and electrical Technology meeting in Maastricht, the Netherlands (February 2011), reports of which are to be found in the current issue of the Journal of Electrocardiology. These examples include simulation of the atrial electrocardiogram, improved accessibility of endocardial source locations, and an explanation of ST elevations accompanying true TQ depressions.

Keywords: Simulation of ECG waveforms; ST level; Equivalent double layer















### CONCLUSIONS

- 1) Type 1 BP has various ECG phenotypes. The typical pattern characterized by ST segment elevation more or equal than 2 mm and negative T waves could be found in one or more right precordial leads, at conventional and/or higher ics. Moreover it could be associated with a novel finding: ST segment depression in inferior leads ( $\geq 0.1$  mV with duration  $\geq 0.08$  s).
- 2) Analysis of the inferior leads could be useful especially in patients with no clear type 1 BP with V1-V2 at the 4<sup>th</sup> ics suggesting the need to record upper right precordial leads.
- 3) The four phenotypes of type 1 BP, identified in our previous work, could have a close relationship not only with the position of RVOT's "area of injury" in the thorax but also with its orientation.

For questions, comments or proposals feel free to contact us: *ep.polime@gmail.com* 

## CONCLUSIONS

4) A three dimensional electrophysiological computed model of Brugada Pattern confirmed the key role of right ventricular outflow tract orientation in the type 1 BP ECG phenotypes. An horizontal RVOT, in fact, gives raise to abnormal BP vector directed both superiorly and anteriorly, explaining, at the same time, ST segment depression in the inferior leads and typical BP appearance in right precordial leads.

5) Cardiac imaging, such as computed tomography and magnetic resonance, or perhaps echocardiography, could find a further validation of this hypothesis.

6) Finally, **further studies** needs to assess a possible prognostic role of various ECG phenotypes of type 1 BP.

For questions, comments or proposals feel free to contact us: *ep.polime@gmail.com*