

L'ECG BASALE NELLA PRATICA CLINICA – CANALOPATIE

Pattern Brugada e Brugada like: come orientarsi

Francesco Luzzza

**CONFLITTI DI
INTERESSE ASSENTI**



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

A Multicenter Report

PEDRO BRUGADA, MD, JOSEP BRUGADA, MD*†

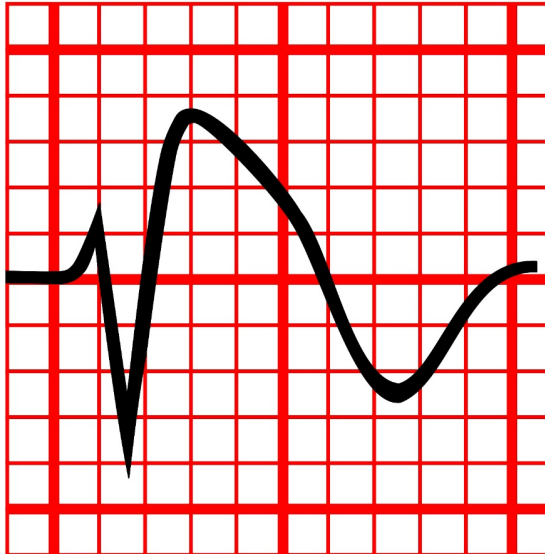
Aalst, Belgium and Barcelona, Spain

Objectives. The objectives of the study were to determine if the clinical and electrocardiographic (ECG) findings in eight patients with recurrent episodes of sudden cardiac death were distinct from those of other syndromes.

Background. Among patients with recurrent episodes of sudden cardiac death who have no structural heart disease defined, the present patients constitute a distinct group.

Methods. The study group consisted of eight patients, four male and two female, with recurrent episodes of sudden cardiac death. Clinical and laboratory data and electrocardiographic, echocardiographic, and exercise testing were available for all patients.

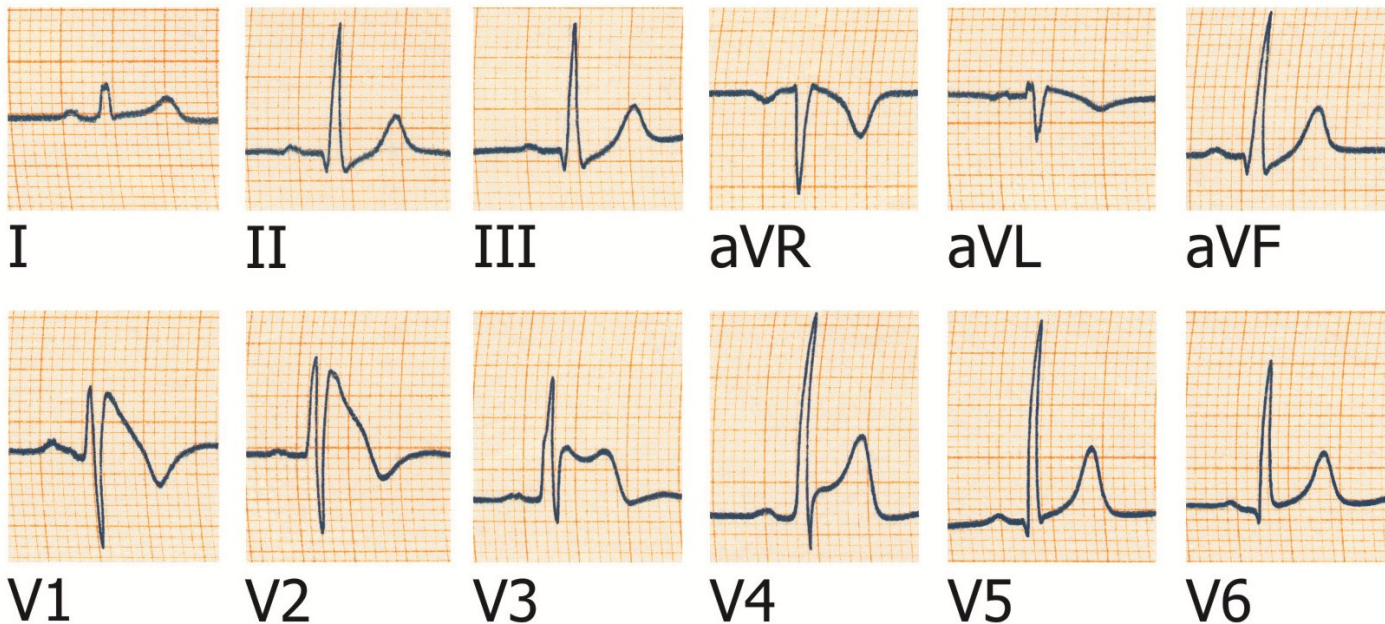
Results. The ECG during sinus rhythm showed right bundle branch block, normal QT interval, and persistent ST segment elevation in precordial leads V₁ to V₄. No electrolyte disturbances, ischemia, or histologic abnormalities were found.



vere performed. The arrhythmia was a rapid polymorphic ventricular tachycardia initiated by two premature beats in four of the seven patients during sinus rhythm. Four patients died suddenly during implantation of a demand ventricular pacemaker. The arrhythmia of two patients was terminated by a beta-adrenergic blocking agent. All four patients survived after implantation of a demand ventricular pacemaker. The arrhythmia of two patients was terminated by a beta-adrenergic blocking agent. All four patients survived after implantation of a demand ventricular pacemaker.

nical and ECG features define a distinct group of patients. Its causes remain unknown.

J Am Coll Cardiol 1992;20:1391-6)



1992

Blocco di branca destra

2026

Brugada

ELECTROCARDIOGRAPHIC PATTERN SIMULATING ACUTE MYOCARDIAL INJURY

BY HAROLD L. OSHER, M.D.
PORTLAND, MAINE

AND

LOUIS WOLFF, M.D.
BOSTON, MASSACHUSETTS

(From the Electrocardiographic Laboratory, Beth Israel Hospital, the Department of Medicine, Harvard Medical School, Boston, Massachusetts, and the Heart Disease Epidemiology Study, National Heart Institute, National Institutes of Health, Public Health Service, Department of Health, Education, and Welfare, Framingham, Massachusetts.)

ABNORMAL displacement of the S-T segment may be associated with a variety of clinical states. In myocardial injury the typical configuration consists of elevation and upward bowing of the S-T segment with symmetrical in-

blood cell counts and erythrocyte sedimentation rates remained normal. Initial electrocardiograms showed right bundle branch block (RBBB) with elevation of S-T segments and inversion of T waves in the right pre-

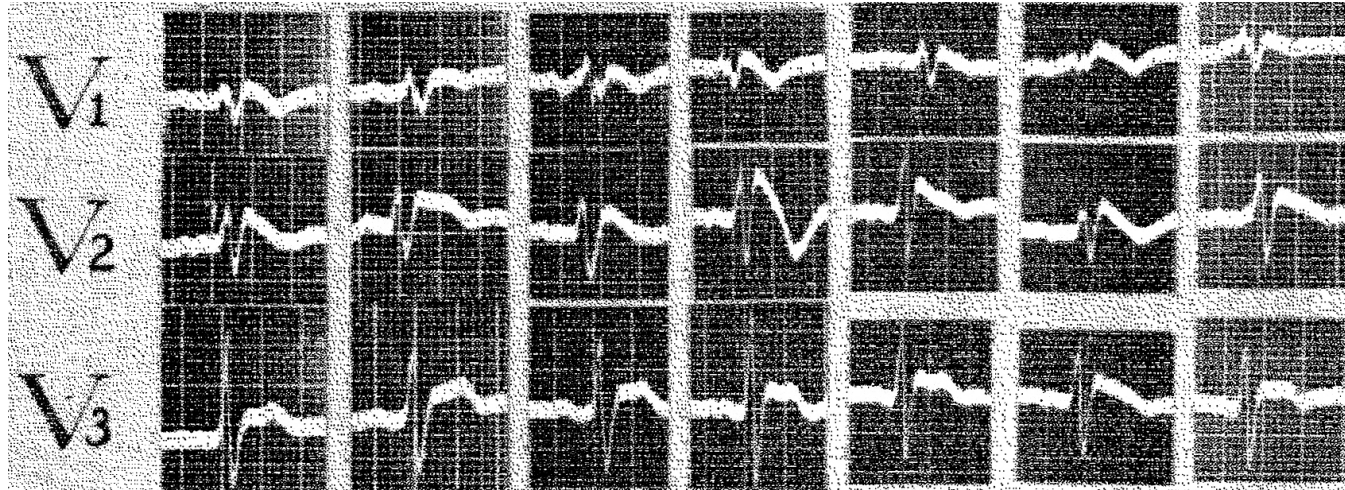
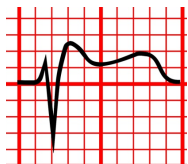
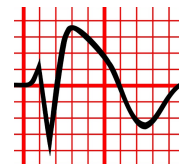


Fig. 1. – Electrocardiogram of a 39-year-old white male with mild atypical chest pain but no clinical evidence of heart disease. Note the wide QRS interval (0.12-0.13 sec) with features of RBBB, and ST segment elevation and T wave inversion in the right precordial leads, simulating the pattern of anteroseptal injury. The serial tracings show minor variations in the ST-T configuration, but not the typical evolution seen with myocardial injury.



QUADRI ECG CHE SIMULANO IL PATTERN DI BRUGADA



- ✓ Blocco di branca destra
- ✓ Ripolarizzazione precoce
- ✓ Ischemia miocardica transmurale
- ✓ Pericardite
- ✓ Ipotermia
- ✓ Compressione sul tratto di efflusso del VD
- ✓ Iperkaliemia
- ✓ Ipercalcemia
- ✓ Embolia polmonare
- ✓ Effetto di Farmaci

FENOCOPIE



...non bisogna mai perdere di vista l'alternativa.

Sherlock Holmes
(Il capitano di lungo corso)



REVIEW ARTICLE

Cardiology Journal
2010, Vol. 17, No. 2, pp. 130–135
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ISSN 1897–5593

Propofol infusion syndrome and Brugada syndrome electrocardiographic phenocopy

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Pattern Brugada e Brugada like: come orientarsi

Brugada Phenocopy

- ECG pattern with a type-1 or type-2 Brugada morphology;
- The patient has an underlying condition that is identifiable and the ECG pattern resolves upon resolution of this condition;
- Low clinical pretest probability of Brugada syndrome (lack of symptoms, medical history and family history);
- Negative provocative testing with a sodium channel blocker;
- Negative genetic testing (not mandatory).

Brugada Sindrome

- ECG pattern with a type-1 or type-2 Brugada morphology;
- The patient has not an underlying condition that is identifiable;
- High clinical pretest probability of Brugada syndrome (presence of symptoms, medical history and family history);
- Positive provocative testing with a sodium channel blocker;
- Positive or negative genetic testing.

Brugada phenocopy etiologic categories

Etiologic categories

Metabolic conditions

Mechanical compression

Ischemia and pulmonary embolism

Myocardial and pericardial disease

ECG modulation

Miscellaneous

**Anselm DD, Evans JM, Baranchuk A.
World J Cardiol 2014;6:81-86**



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JOURNAL OF
Electrocardiology



Brugada phenocopy: Mechanisms, diagnosis, and implications

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Some acquired Brugada patterns are not Brugada phenocopies

Fever-induced Brugada pattern and sodium channel blocker-induced Brugada pattern should not be classified as phenocopies even when fulfilling the aforementioned diagnostic algorithm, since they might present different pathogenesis and prognosis than Brugada phenocopies. **(Acquired sodium channel dysfunction)**

Morphologic classification system for Brugada phenocopy

Type

- Type 1 BrP with a coved Brugada ECG pattern
- Type 2 BrP with a saddleback Brugada ECG pattern

Class

- Class A All mandatory BrP diagnostic criteria are satisfied, including positive results from a provocative drug challenge with sodium channel blockers
- Class B Highly suspected BrP: Not all mandatory criteria are complete*
- Class C Highly suspected BrP: Provocative drug challenge is not indicated and/or justified**

*This group includes cases in which a provocative drug challenge is pending or it is not possible to perform due to various factors, such as the patient is lost to follow-up or deceased.

**This group includes cases in which a provocative drug challenge is not clinically indicated, such as patients with recent surgical right ventricular outflow tract manipulation or BrP secondary to the use of inappropriate high-pass ECG filtering.

Categories	Number of cases	Brugada phenocopy Type	
Metabolic conditions	63	Type 1A:15	Type 2A:1
		Type 1B:35	Type 2B:11
		Type 1C:1	Type 2C: 0
Mechanical compression	18	Type 1A:6	Type 2A:1
		Type 1B:7	Type 2B:2
		Type 1C:2	Type 2C:0
Ischemia and pulmonary embolism	27	Type 1A:7	Type 2A:0
		Type 1B:15	Type 2B:3
		Type 1C:2	Type 2C:0
Myocardial and pericardial disease	12	Type 1A:3	Type 2A:1
		Type 1B:6	Type 2B:2
		Type 1C:0	Type 2C:0
Electrocardiogram modulation	3	Type 1A:0	Type 2A:1
		Type 1B:0	Type 2B:0
		Type 1C:0	Type 2C:2
Miscellaneous	12	Type 1A:0	Type 2A:2
		Type 1B:7	Type 2B:1
		Type 1C:2	Type 2C:0

Updated from www.brugadaphenocopy.com on November 25, 2019.

Cinier G, et al . 2020

Expert cardiologists cannot distinguish between Brugada phenocopy and Brugada syndrome electrocardiogram patterns

Byron H. Gottschalk¹, Daniel D. Anselm¹, Josep Brugada², Pedro Brugada³, Arthur A. Wilde^{4,5}, Pablo A. Chiale⁶, Antoni Bayés De Luna⁸, Andrew D. I. and Adrian Baranchuk^{1*}

¹Department of Cardiology, Cardiac Electrophysiology and Pacing, Kingston General Hospital, Barcelona, Barcelona, Spain; ³Heart Rhythm Management Center, UZ Brussel Academic Medical Center, Amsterdam, The Netherlands; ⁵Princess Al-Jawhara Hospital, Riyadh, Saudi Arabia; ⁶Division of Cardiology, Hospital Ramos Mejia, Buenos Aires, Argentina; ⁷Cardiac Research Center, CSIC-ICCC, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

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What's new?

- The pattern of BrP was found to be indistinguishable from the pattern of BrS among expert physicians.
- As a consequence, clinicians cannot distinguish between the conditions by looking at ECG alone.
- Clinicians are recommended to follow the systematic diagnostic criteria for distinguishing between BrP and BrS.

All that looks like “Brugada” is not “Brugada”: Case series of Brugada phenocopy caused by hyponatremia

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^b Department of Cardiology, Borgess Medical Center/Michigan State University, Kalamazoo, MI



Na⁺
112mEq/L

Expert cardiologists cannot distinguish between Brugada phenocopy and Brugada syndrome electrocardiogram patterns

Byron H. Gottschalk¹, Daniel D. Anselm¹, Josep Brugada², Pedro Brugada³, Arthur A. Wilde^{4,5}, Pablo A. Chiale⁶, Andres R. Pérez-Riera⁷, Marcelo V. Elizari⁶, Antoni Bayés De Luna⁸, Andrew D. Krahn⁹, Hanno L. Tan⁴, Pieter G. Postema⁴, and Adrian Baranchuk^{1*}

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Pattern Brugada e Brugada like: come orientarsi



ELETTROCARDIOGRAFIA DEDUTTIVA



“Uno scienziato deve rifiutare ogni memorizzazione non ragionata”.

“Ogni quadro elettrocardiografico ha un significato particolare che va interpretato e non semplicemente imparato a memoria. Una buona memoria non è infatti di per sé strumento sufficiente a raggiungere la condizione di scienziato o di medico”.

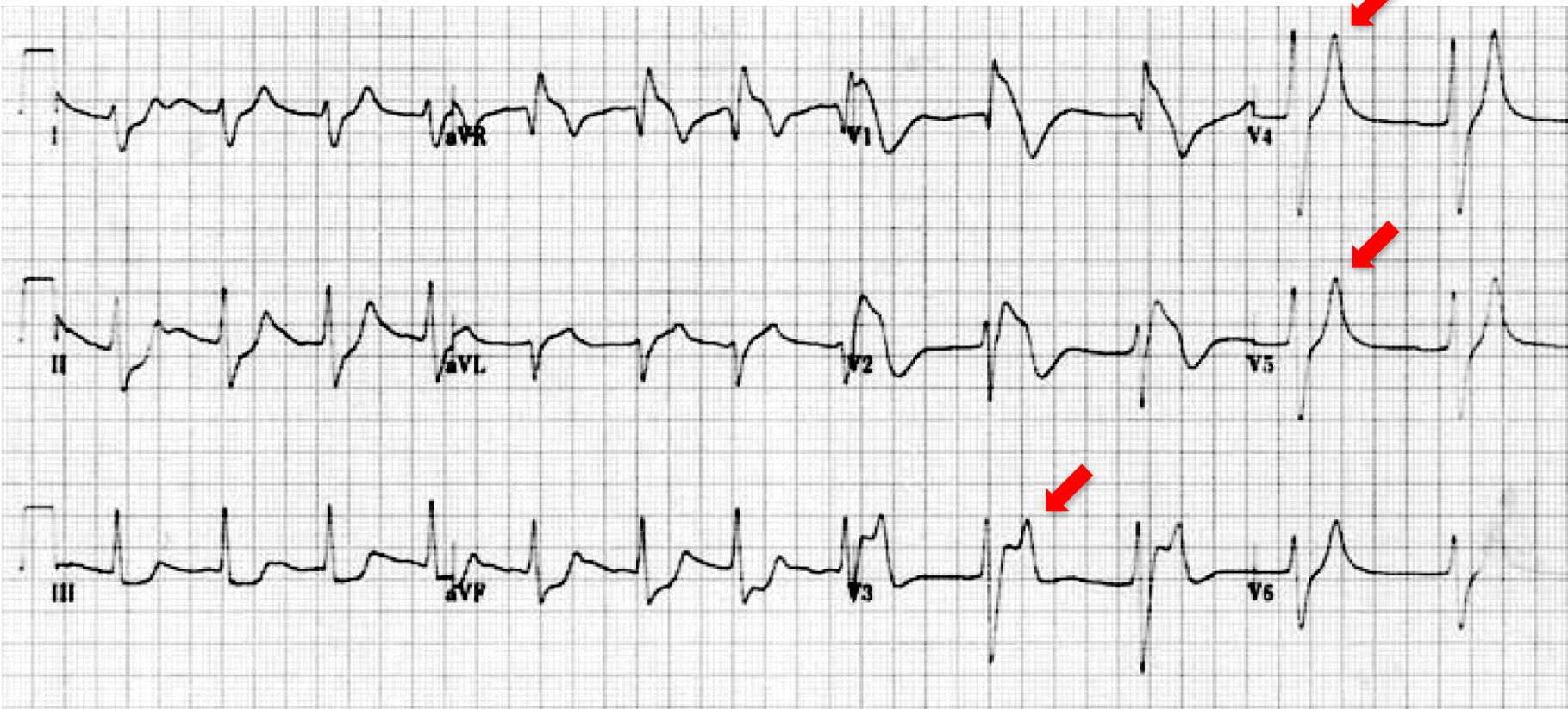
Brugada Pattern Electrocardiographic Changes Associated with Profound Electrolyte Disturbance

JASON C. KOVACIC and DENNIS L. KUCHAR

From the Cardiology Department, St. Vincent's Hospital, Darlinghurst, Sydney, Australia

KOVACIC, J.C., ET AL.: Brugada Pattern Electrocardiographic Changes Associated with Profound Electrolyte Disturbance. *Only a few case reports of Brugada pattern ECG changes caused by electrolyte disturbance exist in the literature, all of which lack adequate electrophysiological exclusion (or inclusion) of an underlying Brugada syndrome. This report describes a case of an otherwise healthy 38-year-old man who presented to the hospital with diabetic ketoacidosis, profound electrolyte disturbance, and Brugada pattern ECG changes. Subsequent flecainide drug challenge and electrophysiological studies ruled out an underlying Brugada syndrome. (PACE 2004; 27:1020–1023)*

Brugada syndrome, electrolyte, glucose, hyponatremia, acidosis, hyperkalemia



Kovacic JC, Kuchar DL. PACE 2004

The hyperkalemic Brugada sign

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William D. Brearley Jr, MD

Department of Internal Medicine, Carolinas Medical Center, Charlotte, NC, USA

Received 2 August 2006; accepted 16 October 2006

Abstract

Background: A few case reports have indicated that hyperkalemia can induce a Brugada pattern in the electrocardiogram. The specific clinical and electrocardiographic features of the hyperkalemic Brugada sign, however, have not been previously described.

Methods: A case series was collected from hospitalized hyperkalemic patients with a type I Brugada pattern in the electrocardiogram, and a literature review was performed. Electrocardiograms were examined for rhythm and morphology, and clinical characteristics were analyzed.

Results: Nine new cases with the hyperkalemic Brugada sign were identified with an additional 15 cases found in the literature. Of the 9 cases, 8 were male patients, and all were critically ill; 5 of the 9 died within 48 hours. The mean ($\pm$ SD) serum potassium level was 7.8 ± 0.5 mEq/L. The mean QRS width was 144 ± 31 milliseconds, and all had abnormal QRS axis. In 6 cases, there was a wide complex rhythm without visible P waves. The clinical and electrocardiographic characteristics of 15 cases found in the literature were remarkably similar to those in our series.

Conclusions: The hyperkalemic Brugada pattern differs in substantial ways from the electrocardiogram of patients with the genetic Brugada syndrome. Many patients have wide complex rhythms without visible P waves, marked QRS widening, and an abnormal QRS axis. Most patients are male, and many are critically ill. Prompt recognition of this clinical and electrocardiographic entity may expedite the initiation of appropriate treatment for hyperkalemia.

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Keywords:

Hyperkalemia; Electrocardiogram; Brugada syndrome; Brugada sign

Images in Cardiology

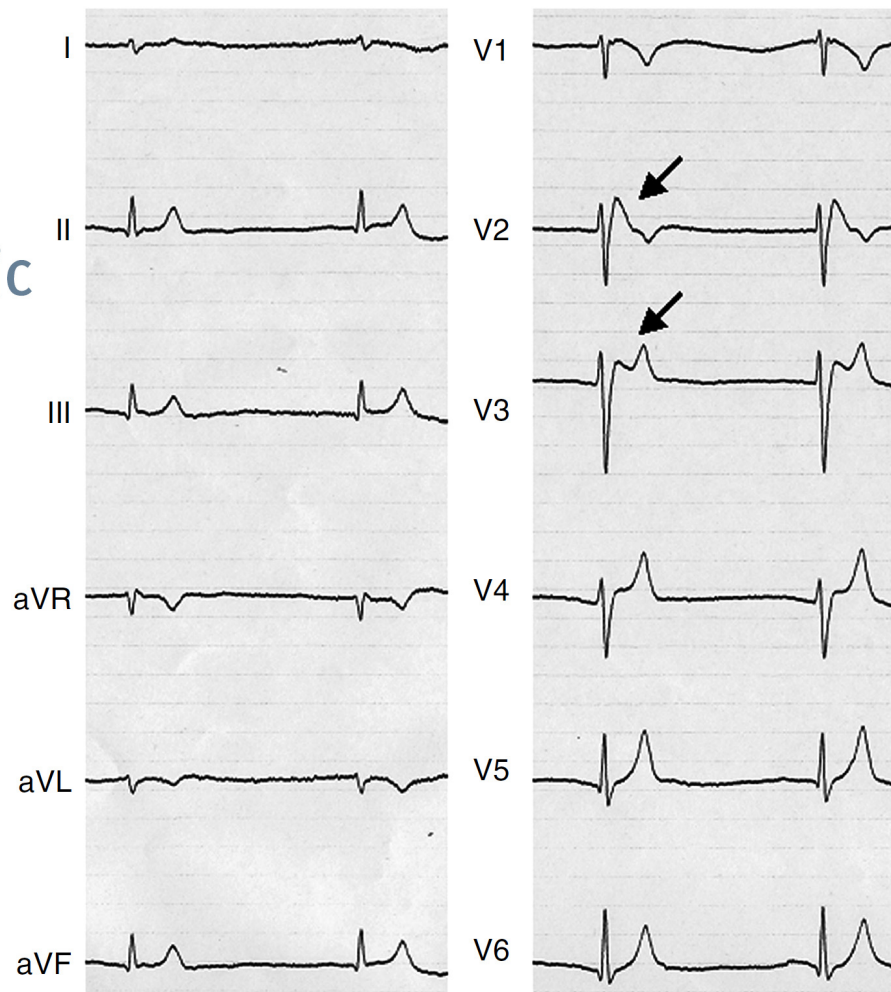
Images edited by James Hill, MD.

Brugada-like Electrocardiographic Pattern Due to Hyperkalemia

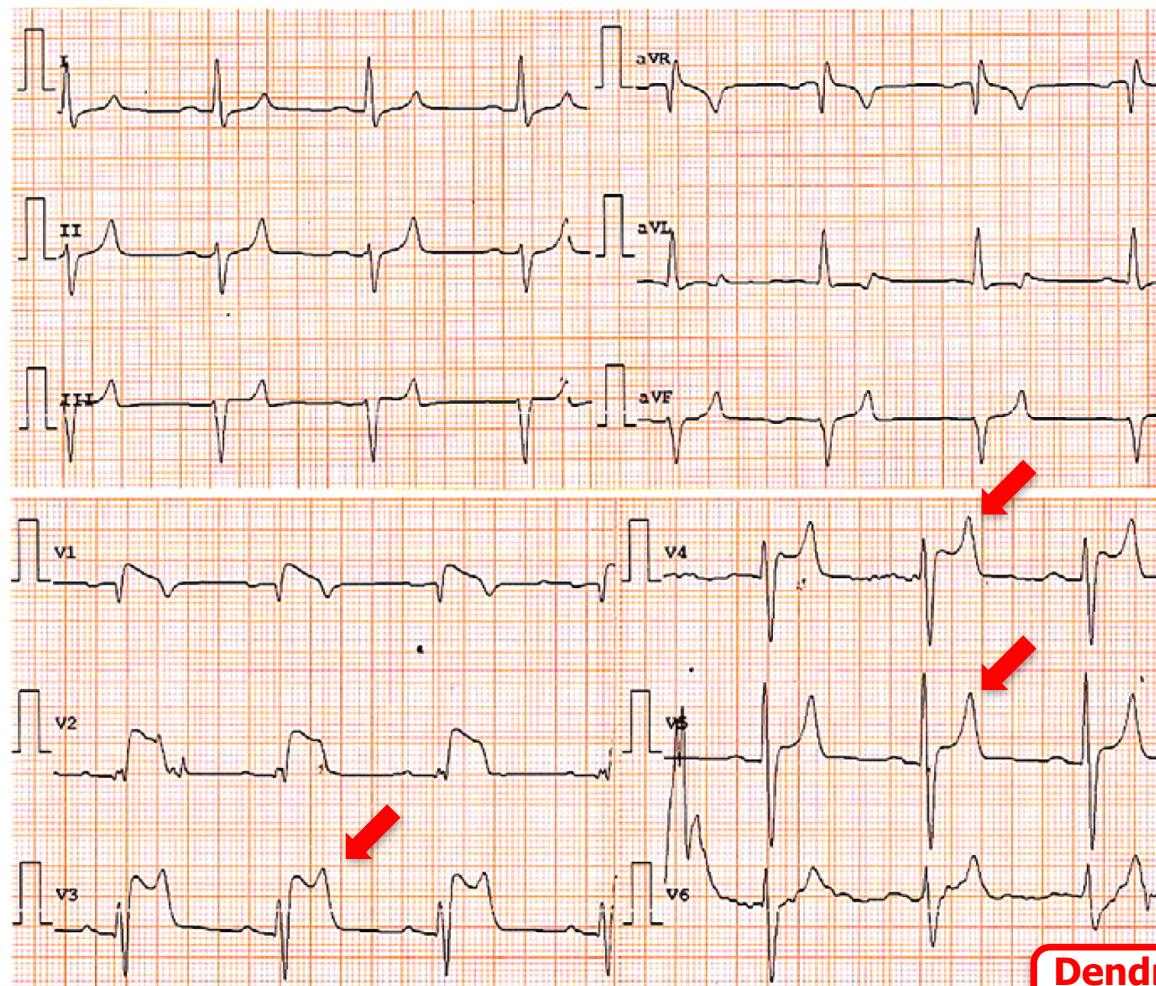
Satoshi Kurisu, MD; Ichiro Inoue, MD; Takuji Kawagoe, MD

Department of Cardiology, Hiroshima City Hospital, Hiroshima, Japan

Clin Cardiol, 2009



**K⁺ 8,7
mEq/L**



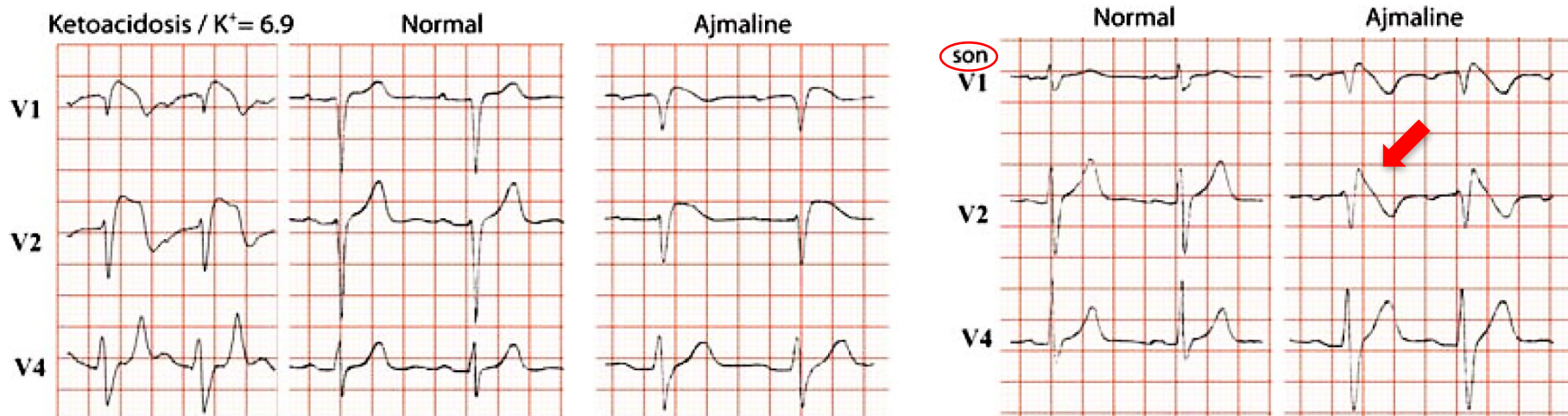
**Dendramis G, et al.
Am J Emergen Med 2017**

Familial Brugada syndrome uncovered by hyperkalaemic diabetic ketoacidosis

Pieter G. Postema^{1*}, Alexander P.J. Vlaar², J. Hans DeVries², and Hanno L. Tan¹

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Journal of Electrocardiology

journal homepage: www.jecgonline.com



True Brugada syndrome ECG or Brugada phenocopy ECG? Can the ECG itself tell us the diagnosis?

Takashi Nakashima, MD, PhD ^{a,b,*}, Masaru Nagase, MD ^a, Taro Shibahara, MD ^a, Daiju Ono, MD ^a, Takehiro Yamada, MD ^a, Gen Tanabe, MD ^a, Keita Suzuki, MD ^a, Makoto Yamaura, MD ^{a,c}, Takahisa Ido, MD ^{a,b}, Shigekiyo Takahashi, MD, PhD ^a, Takuma Aoyama, MD, PhD ^{a,b,c}

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^b Department of Cardiology, Graduate School of Medicine, Gifu University, Gifu, Japan

^c Department of Molecular Pathophysiology, Shinshu University Graduate School of Medicine, Matsumoto, Nagano 390-8621, Japan

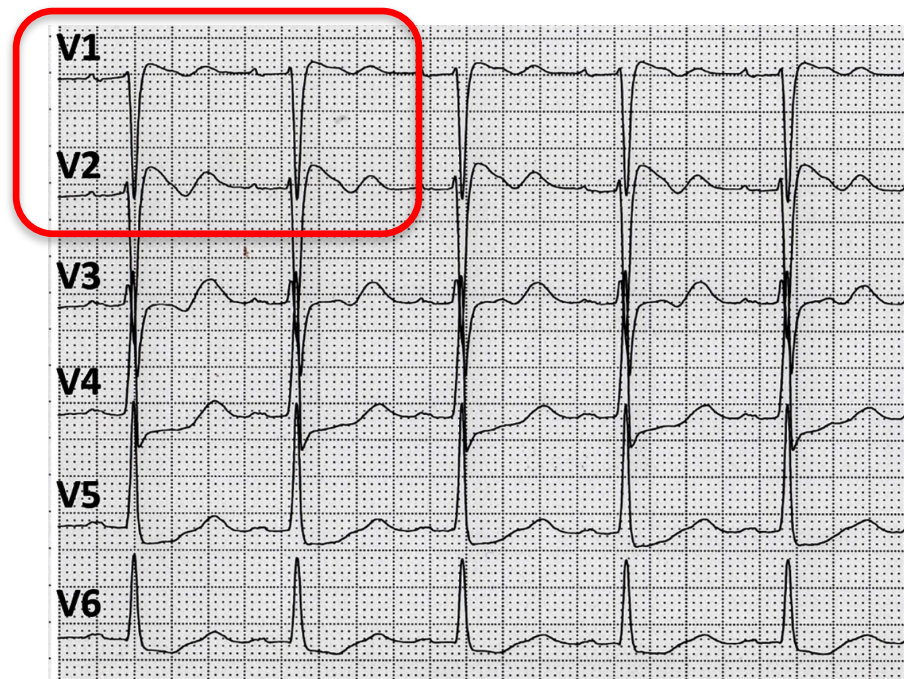
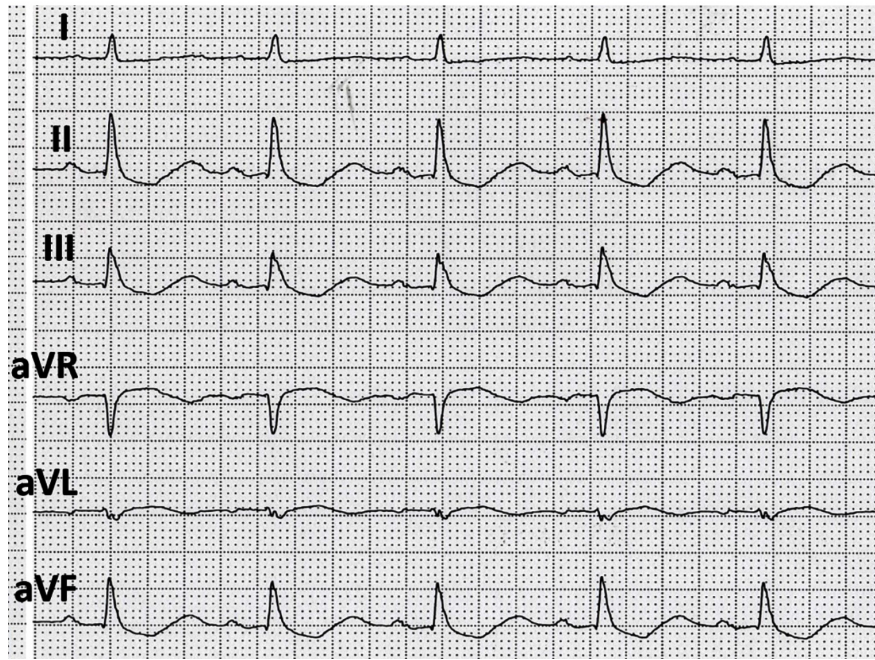
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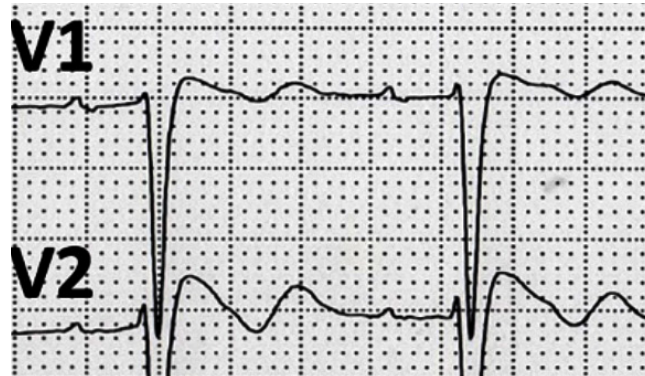
Brugada phenocopy
Brugada syndrome
Electrocardiogram
Hypokalemia
U wave

ABSTRACT

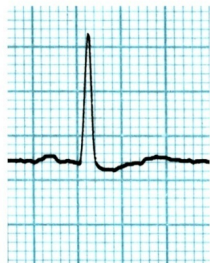
We described a type 1 Brugada electrocardiogram and discussed about the potential diagnostic electrocardiographic indicators to differentiate true Brugada syndrome and Brugada phenocopy.



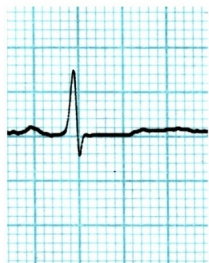
**K⁺ 1,6
mEq/L**



**Nakashima T, et al.
J Electrocardiol 2022**



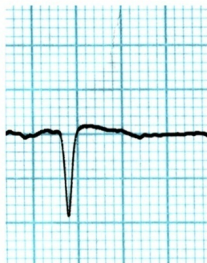
I



II



III



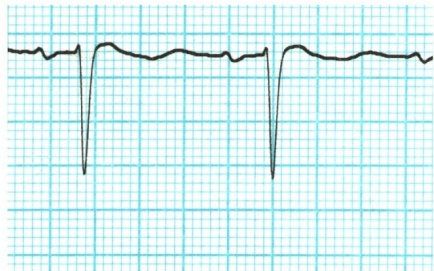
aVR



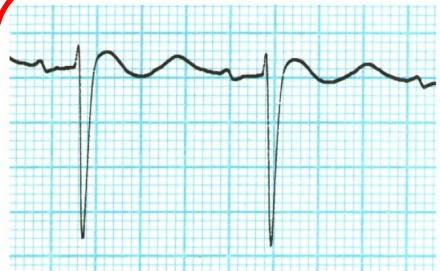
aVL



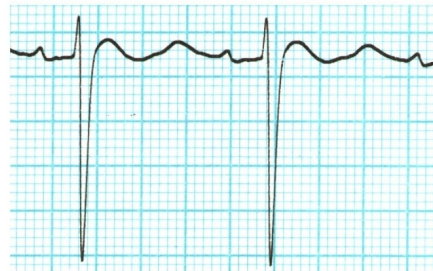
aVF



V1



V2



V3



V4



V5



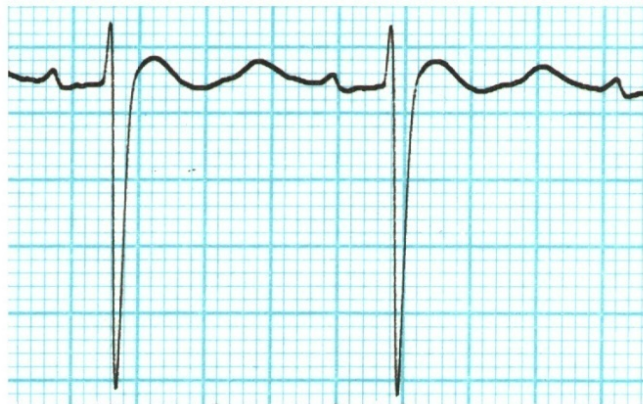
V6



Caso 169



V2



V3

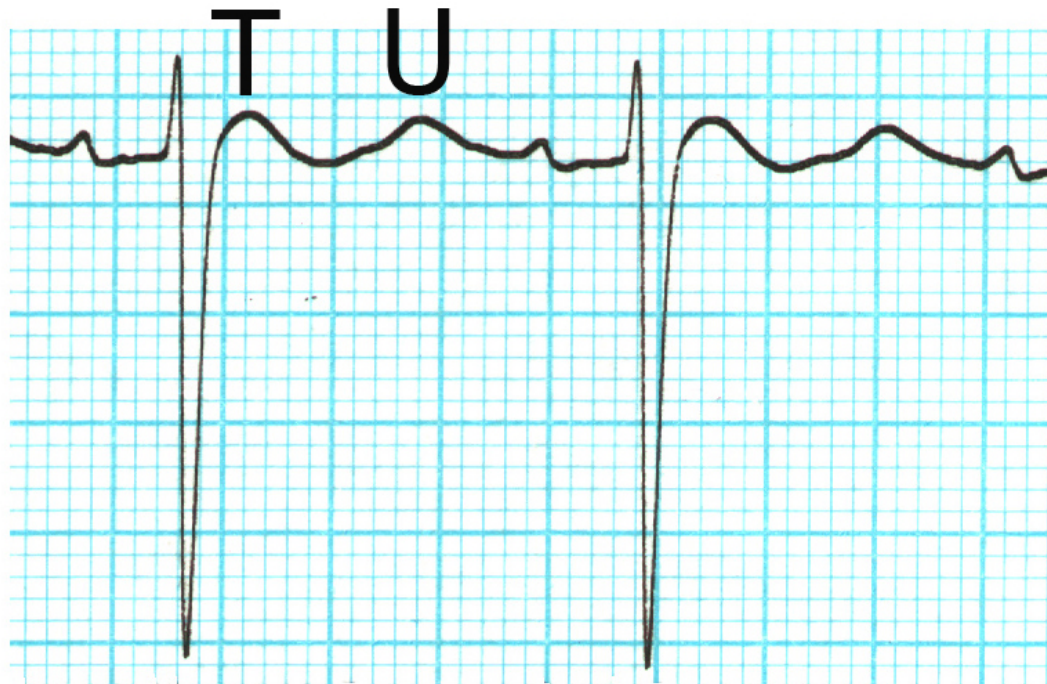


Caso 169



Anche il più piccolo dettaglio può essere essenziale.

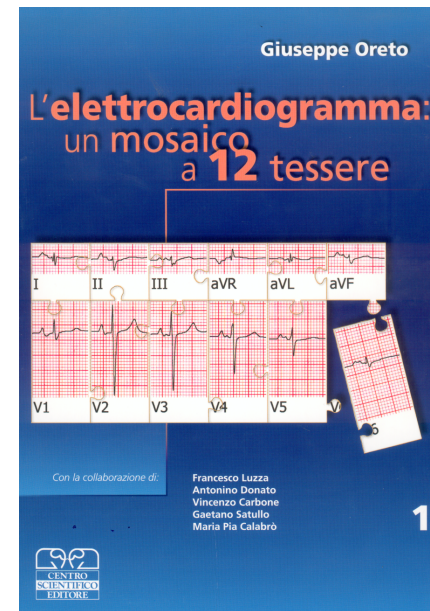
Sherlock Holmes
(L'avventura del cerchio rosso)



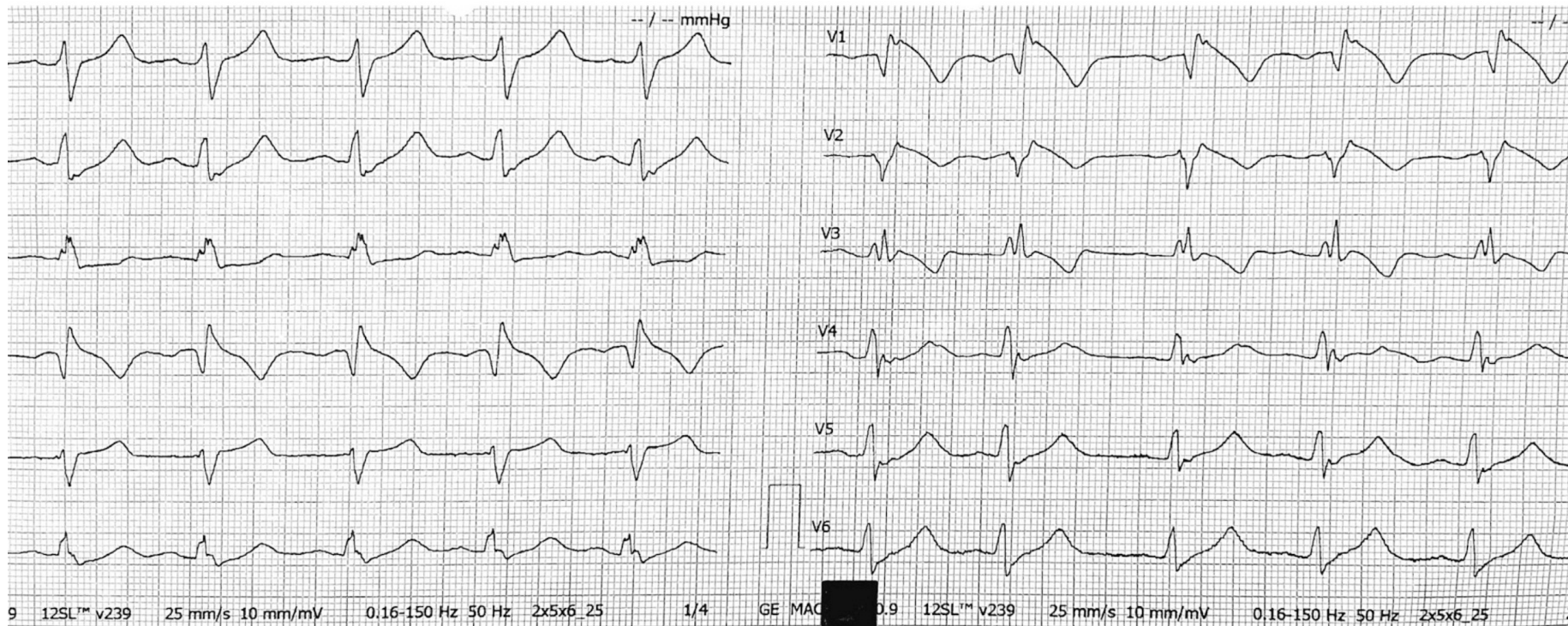
V3

K⁺⁺
2,5mEq/L

Ca⁺⁺
16,9mg%



Caso 169



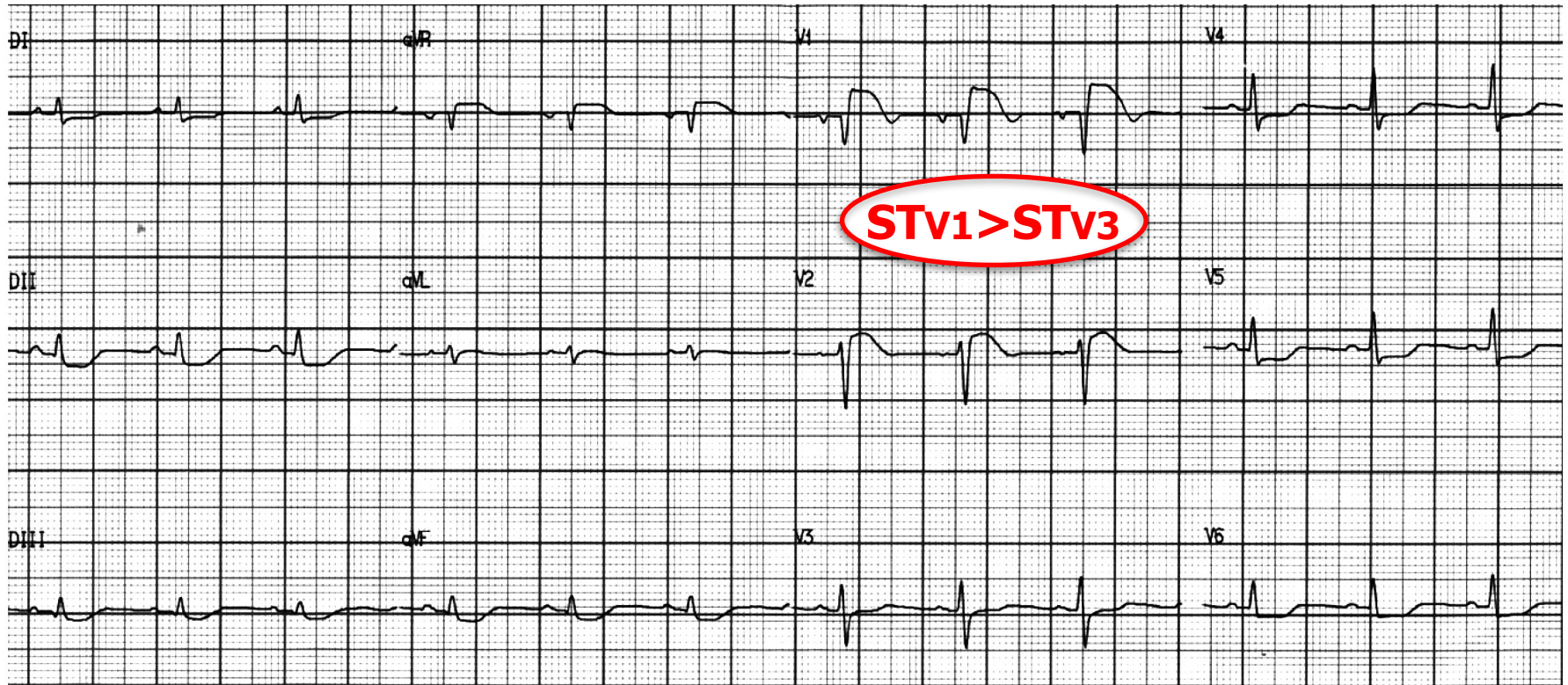
Brugada phenocopy associated with multiple psychotic drugs

Enes Elvin Gul, MD, FESC, FEHRA^{*}, Gokhan Bektasoglu, MD, Zeki Dogan, MD

Department of Cardiology, Istanbul Atlas University, Medicine Hospital, Istanbul, Turkiye

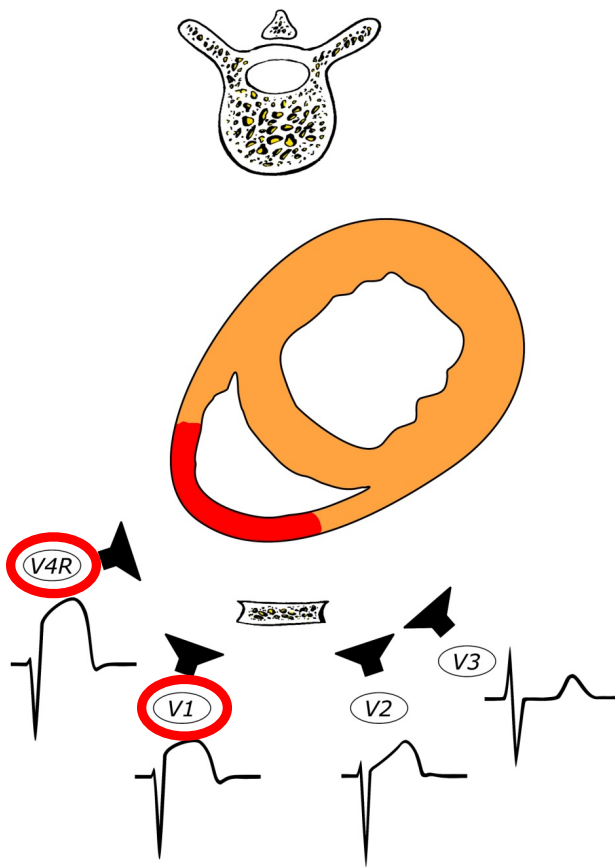


J Electrocardiol 2023;81:156-158



**Pérez- Riera AR, et al.
Ann Noninvasive Electrocardiol 2018**

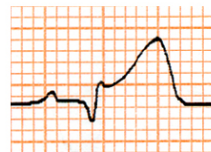
Infarto del ventriculo destro



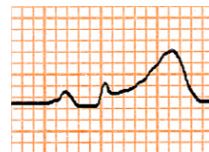
ST III > ST II



II



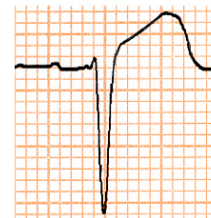
III



aVF



V1

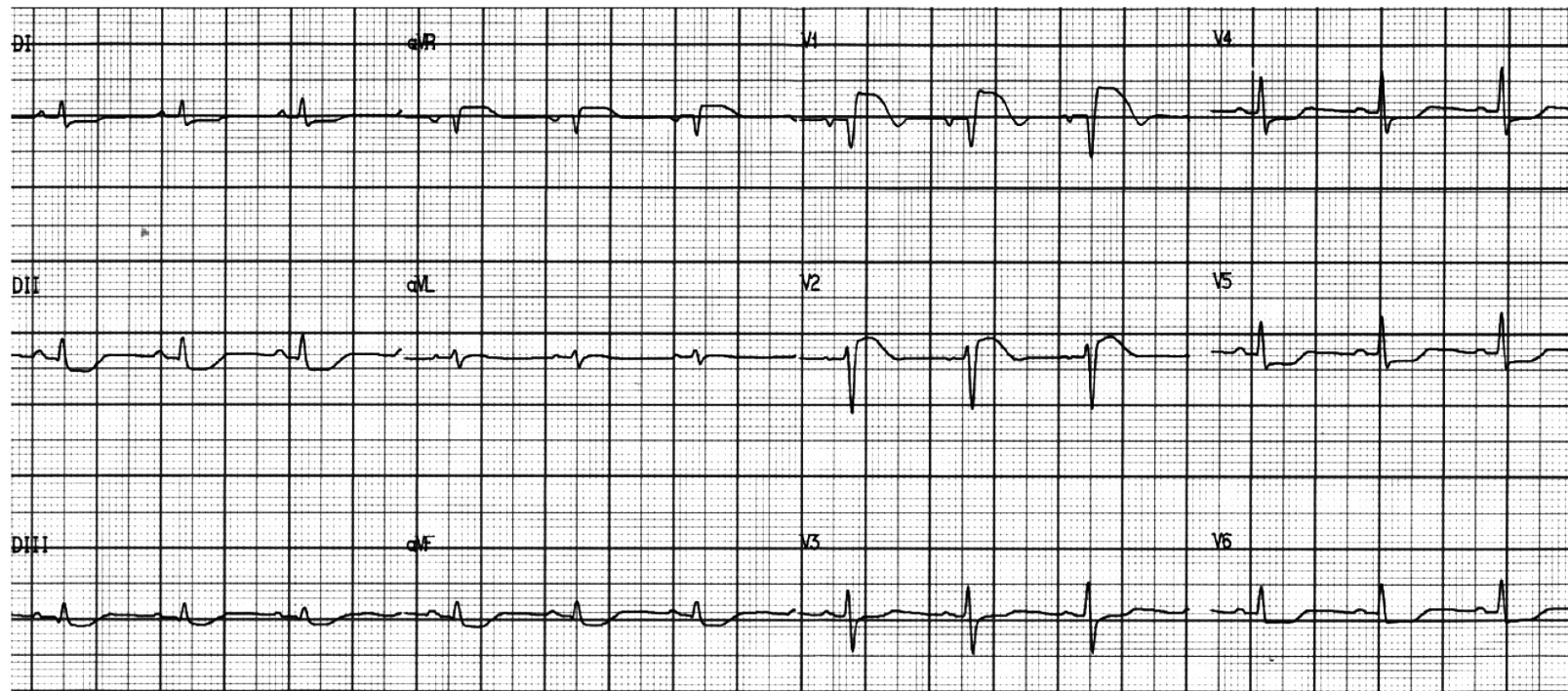


V2



V3

ST_{V1} > ST_{V3}



*Non dobbiamo mai dimenticare il vecchio assioma
che quando tutte le altre ipotesi falliscono, quel
che rimane, per quanto improbabile, non può che
essere la verità.*

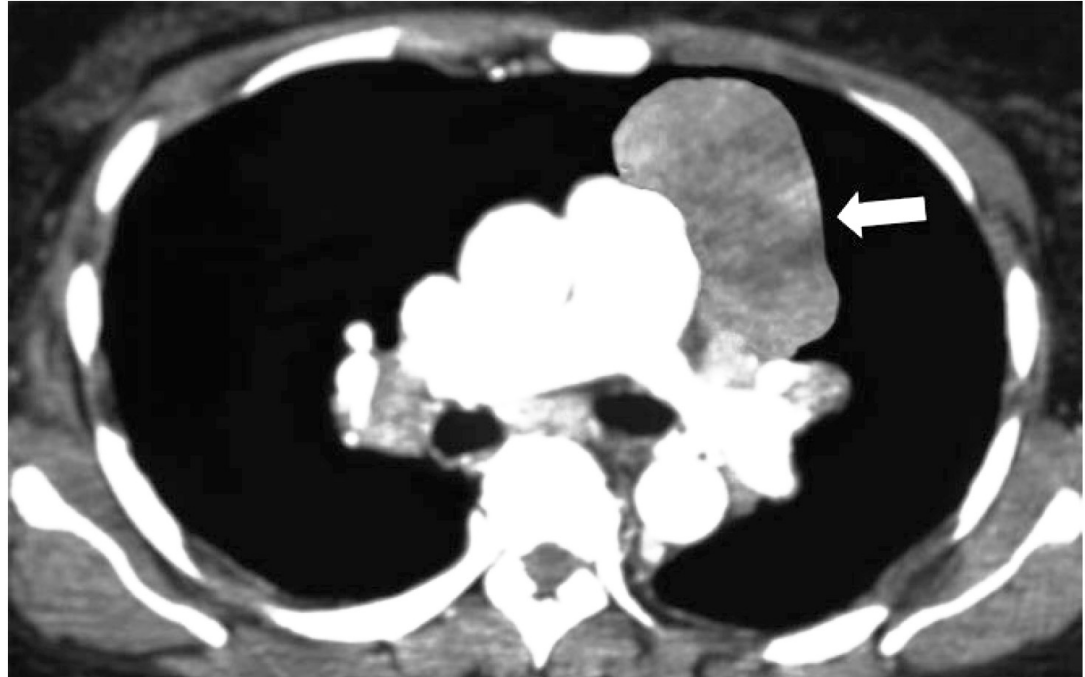
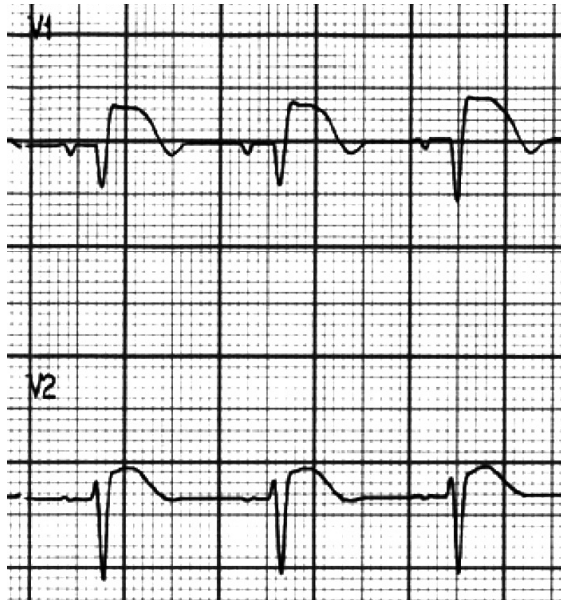
Sherlock Holmes

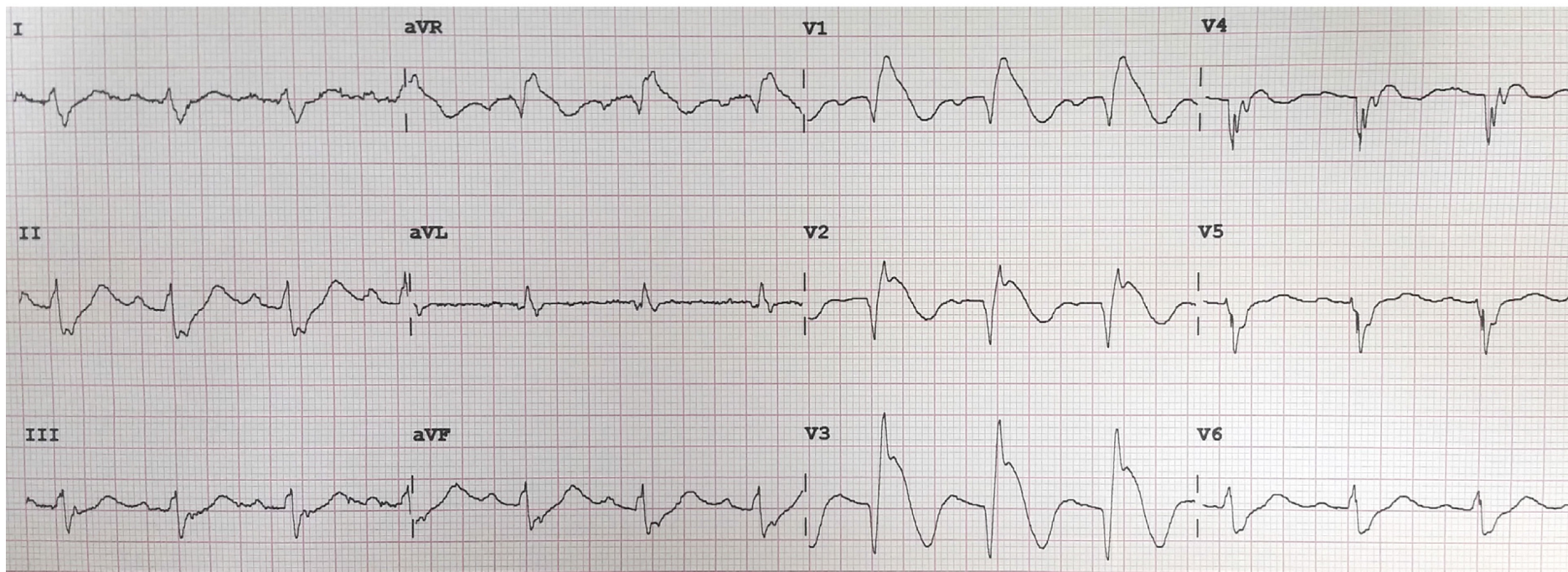
(L'avventura dei progetti Bruce-Partington)

Brugada phenocopy caused by a compressive mediastinal tumor

Andrés R. Pérez-Riera MD, PhD¹  | Raimundo Barbosa Barros MD² |
Rodrigo Daminello-Raimundo PhD¹ | Marianne P. C. Resende Barbosa MSc¹  |
Luiz C. de Abreu PhD¹

Ann Noninvasive Electrocardiol 2018





Gul EE, et al. J Elettrocardiol 2018



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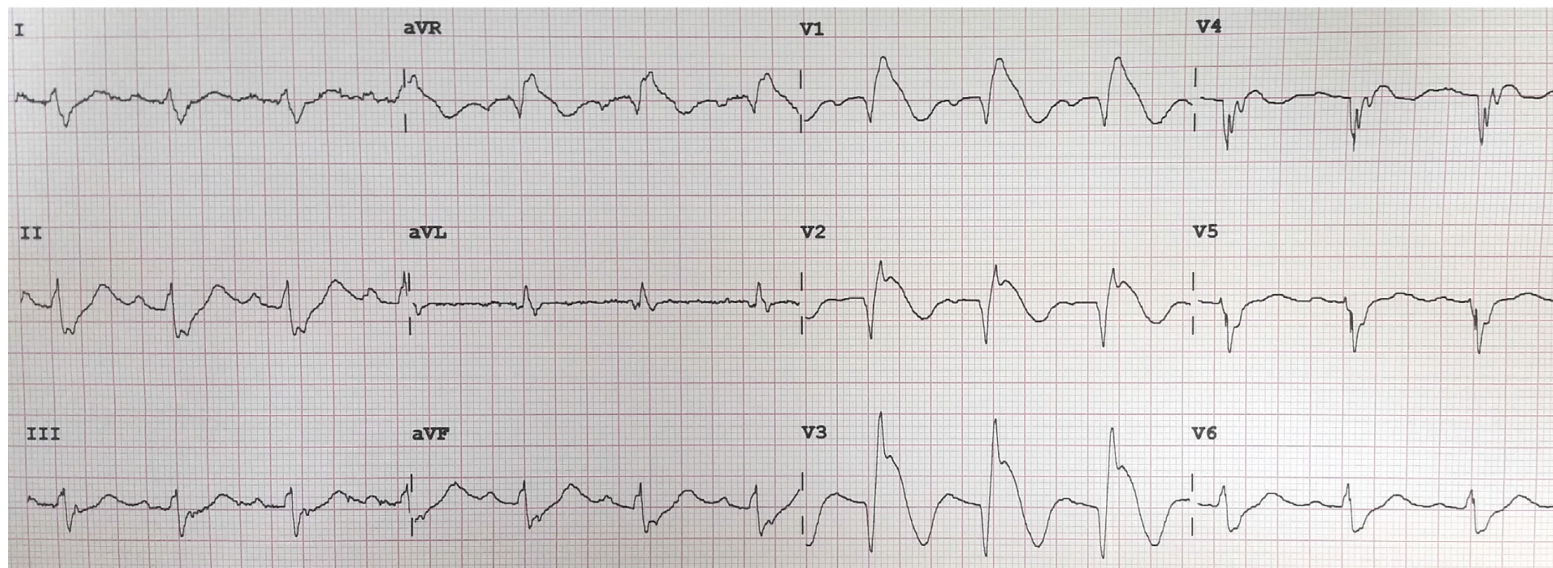
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JOURNAL OF
Electrocardiology

Brugada phenocopy associated with left ventricular aneurysm

Enes Elvin Gul ^{a,*}, Sohaib Haseeb ^b, Osama Al Amoudi ^a, Adrian Baranchuk ^b



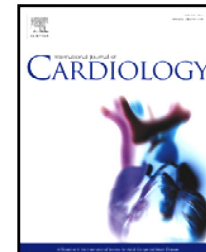


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International Journal of Cardiology

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Letter to the Editor

Brugada phenocopy in acute pulmonary embolism



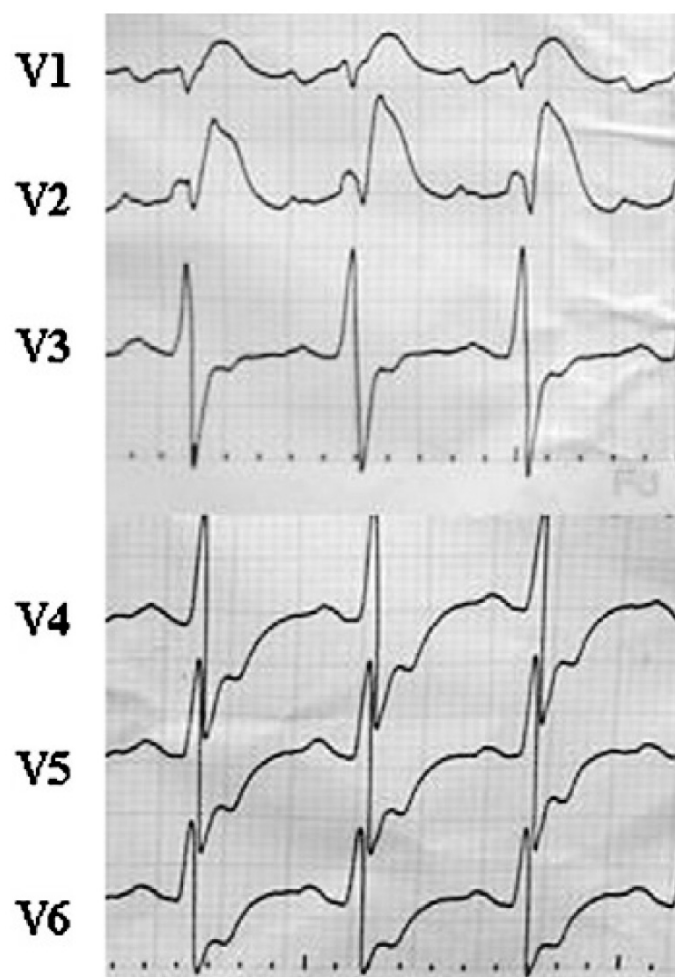
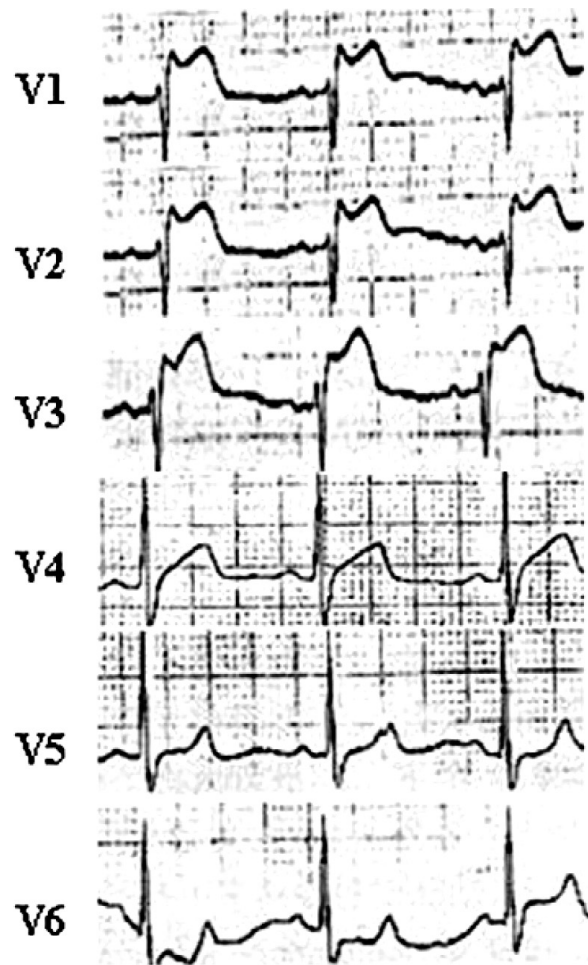
Zhong-Qun Zhan^{a,*}, Chong-Quan Wang^a, Kjell C. Nikus^b, Andrés Ricardo Pérez-Riera^c, Adrian Baranchuk^d

^a Department of Cardiology, Shiyan Taihe Hospital, Hubei University of Medicine, Shiyan City, Hubei Province, China

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L'ECG BASALE NELLA PRATICA CLINICA – CANALOPATIE

Pattern Basale e Brugada like:
come orientarsi!

GRAZIE!

Francesco Luzzza

