



CONGRESSO

ROMA, 25 - 27 Giugno 2026

SEDE DEI LAVORI

A. Roma Lifestyle Hotel
Via Giorgio Zoega 59, Roma

Quali pazienti con pattern ECG di Brugada trattare?

Prof. Fiorenzo Gaita

*Department of Medical Sciences, University of
Turin,*

J Medical TO & IRCCS S. Donato MI



Disclosures:

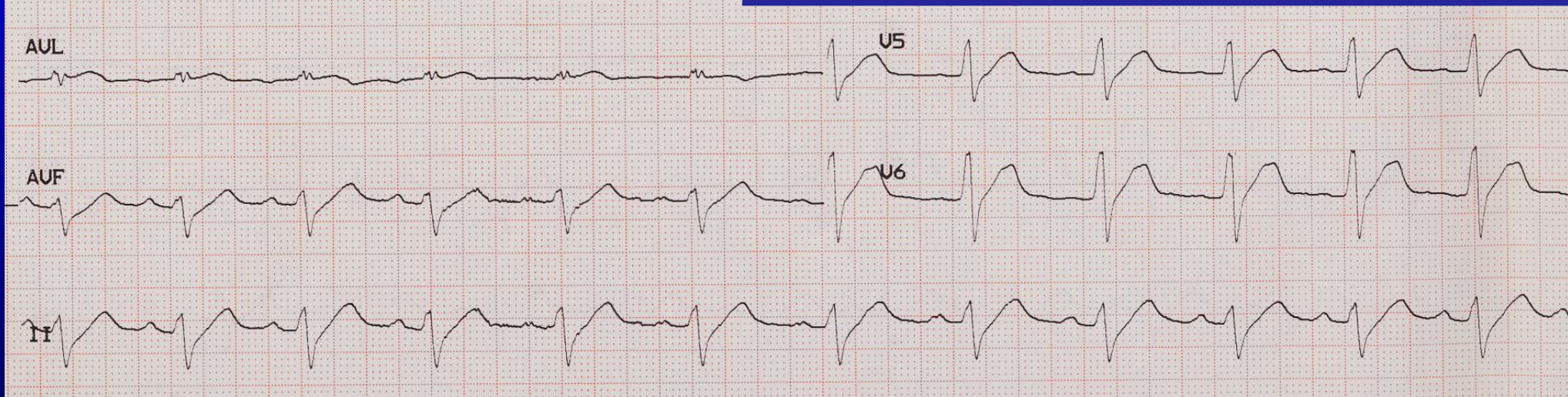
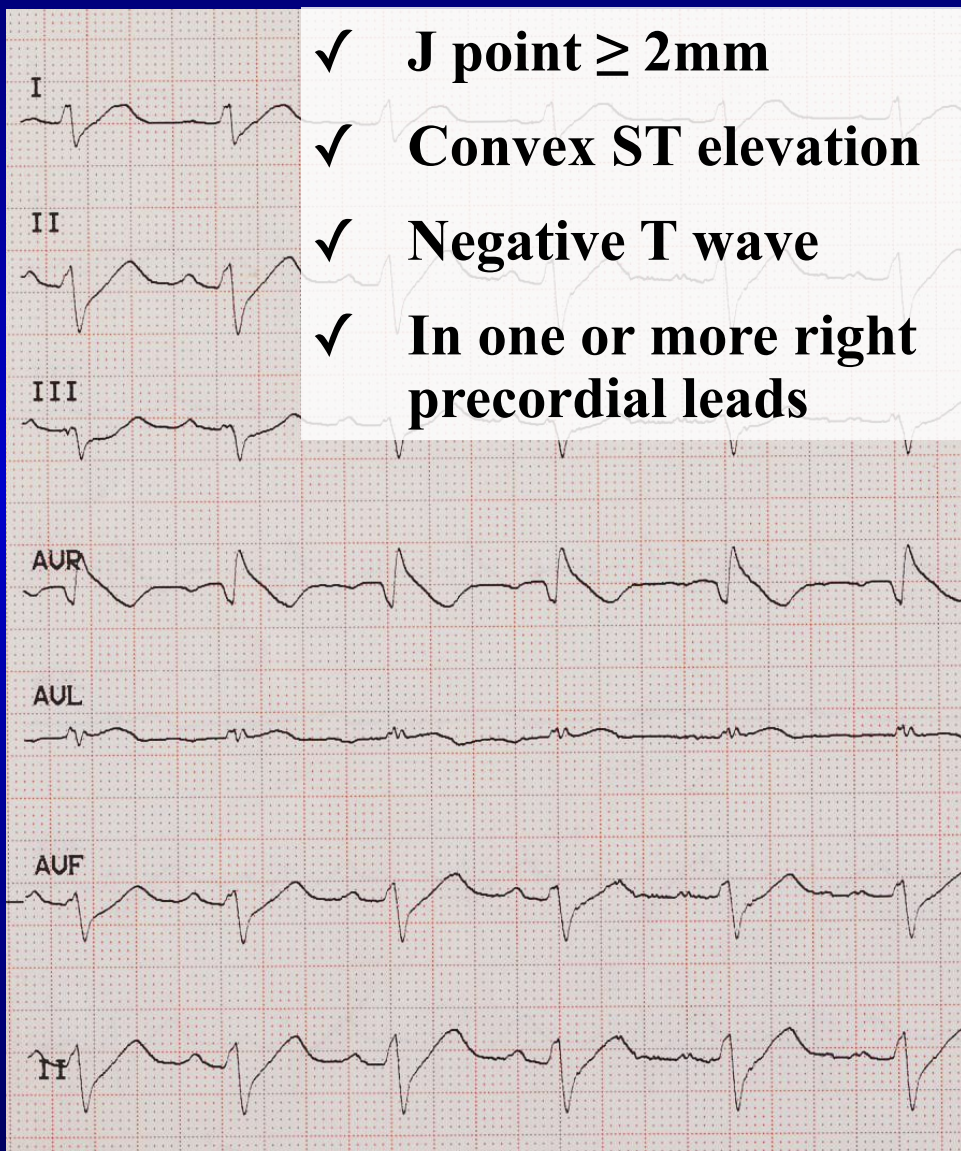
F. Gaita, C. Pappone

Minerva Medica 2026



Electrocardiographic diagnosis: type 1 pattern

- ✓ J point $\geq 2\text{mm}$
- ✓ Convex ST elevation
- ✓ Negative T wave
- ✓ In one or more right precordial leads



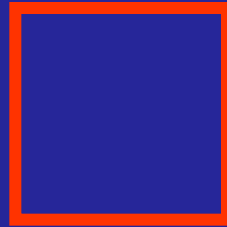
Brugada ECG pattern

Signature is "Dynamic" ECG pattern

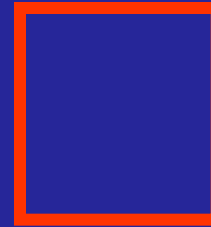
7 luglio 2005



19 ottobre 2005



14 marzo 2006

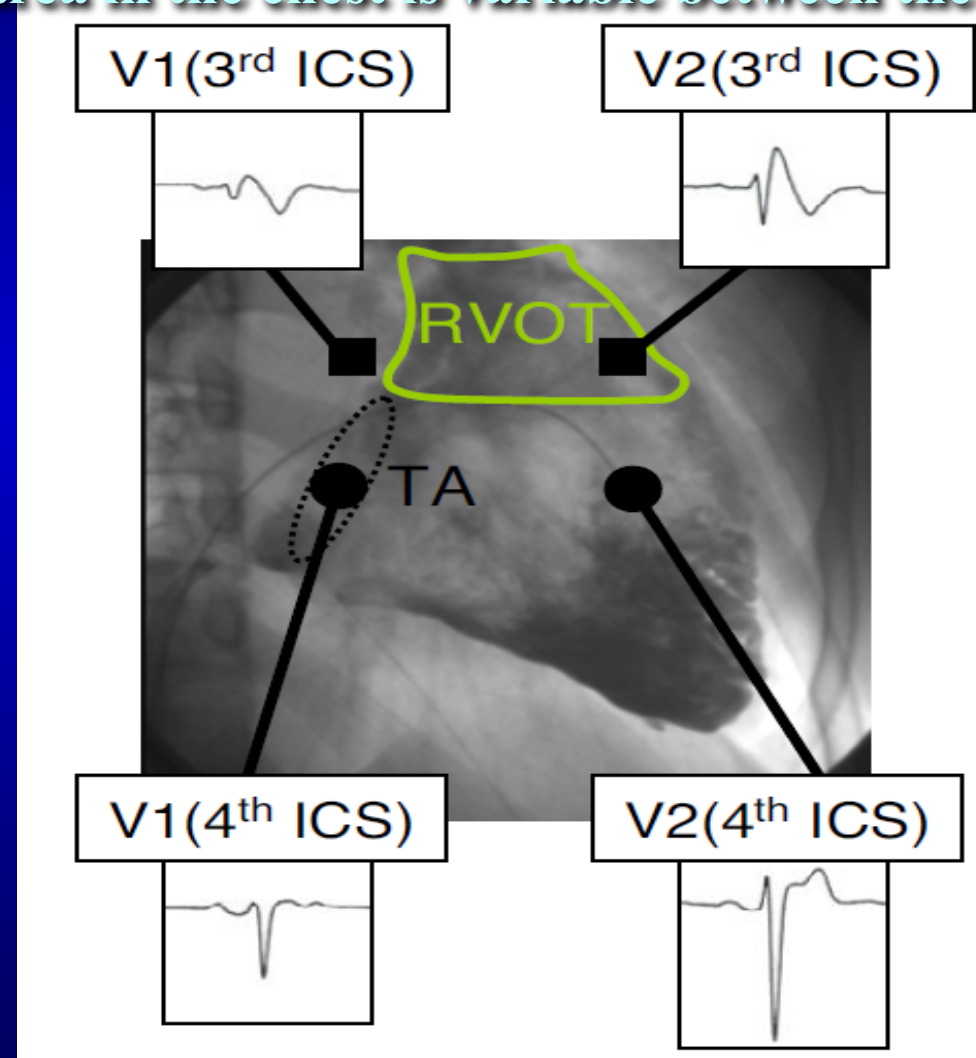


3 novembre 2006



Correlation between RVOT position and exploring electrodes

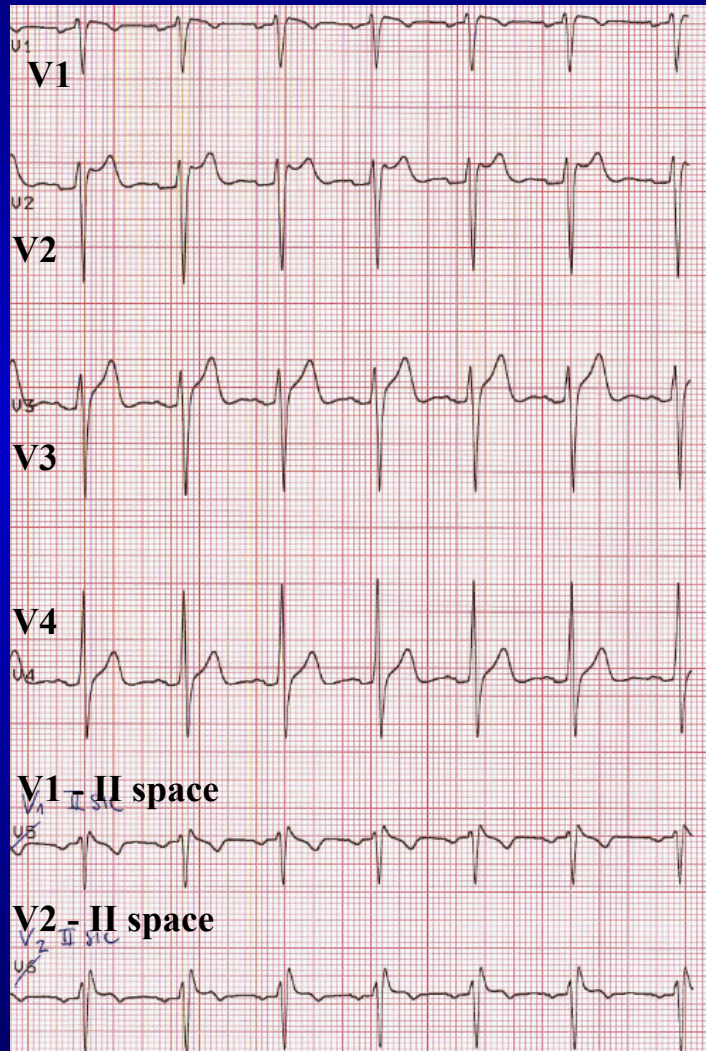
RVOT is the section of the myocardium where I_{to} is more represented
and this area in the chest is variable between the 2nd and 4th ICS



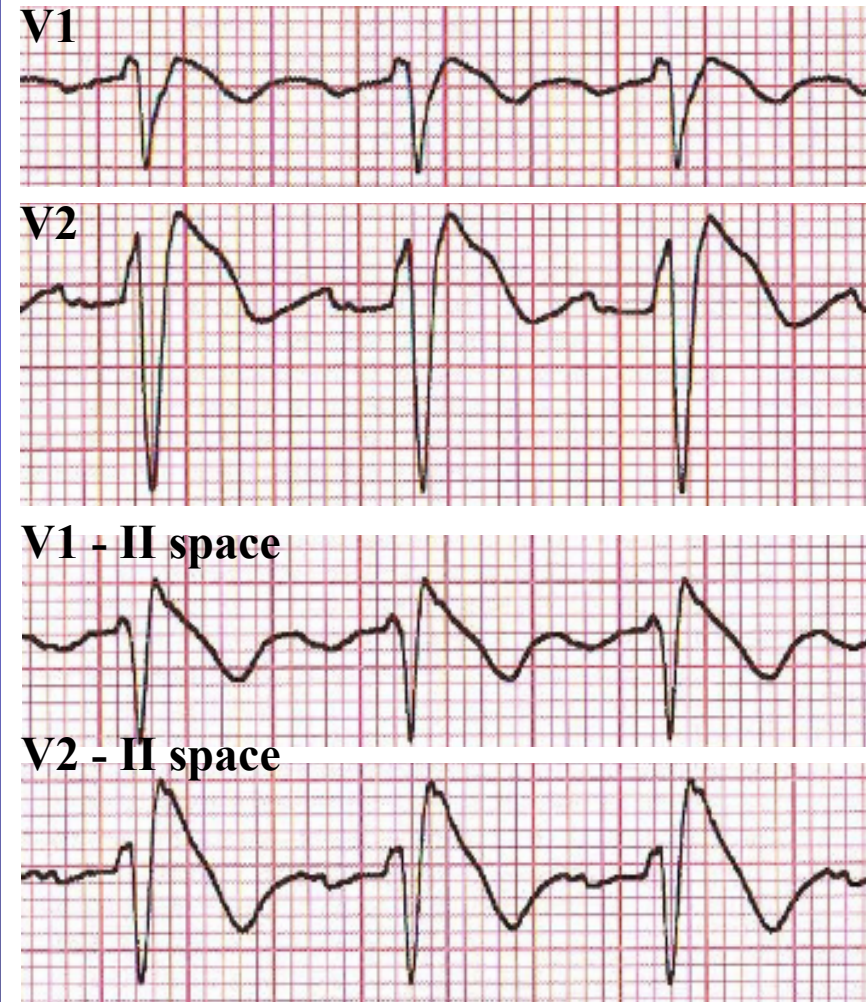
ICS= intercostal space

Pharmacological challenge with Na⁺-channel blockers

Suspicious ECG



Ajmaline infusion (1mg/kg in 5 min)



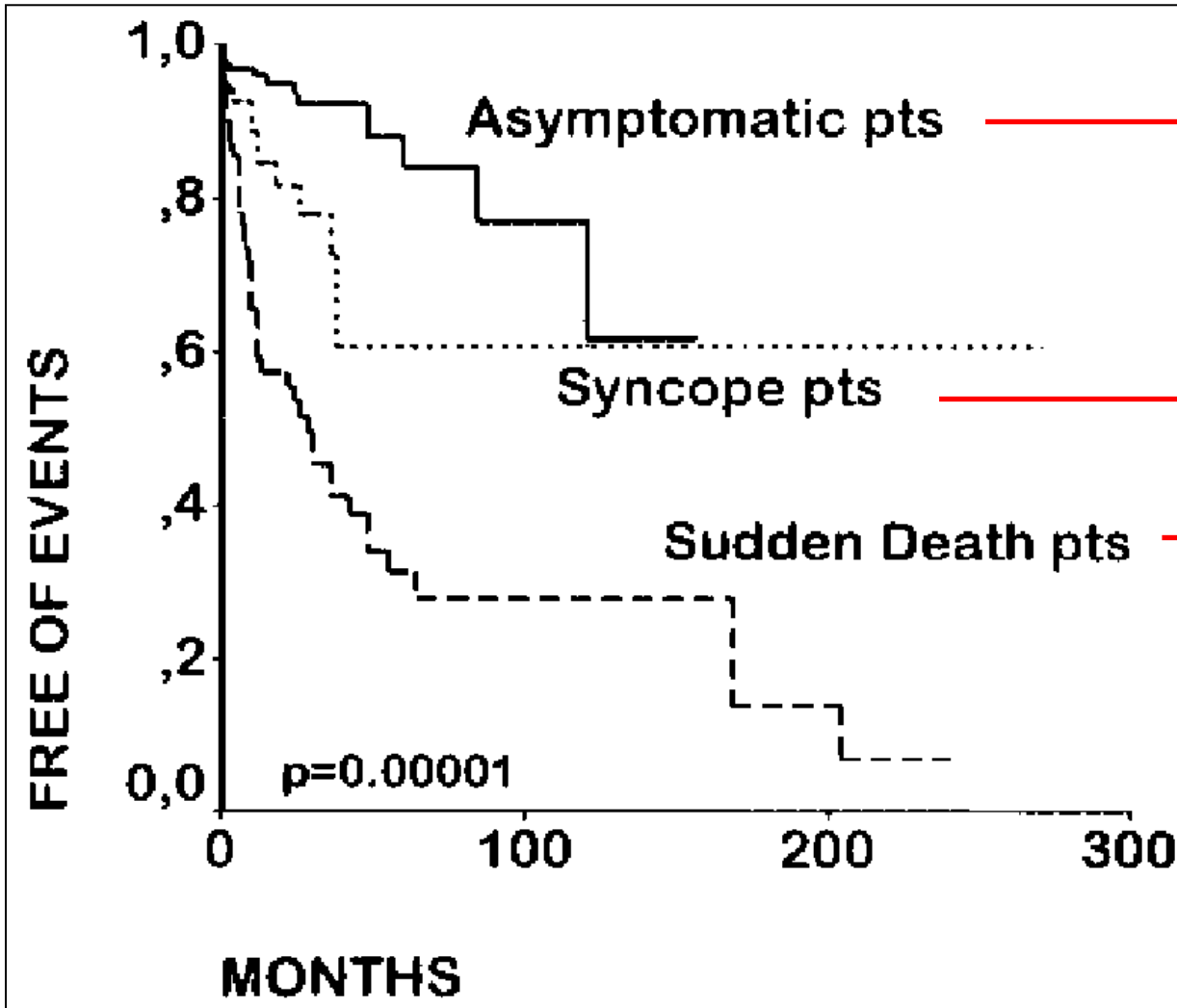
**What is the risk of sudden death
in a patient with brugada-type ECG ?**

How to identify patients at risk?

How to treat patients at risk?

How to identify patients at risk?

Arrhythmic Events (VF/SCD) during Follow-up According to Clinical Presentation



asymptomatic
4% - year

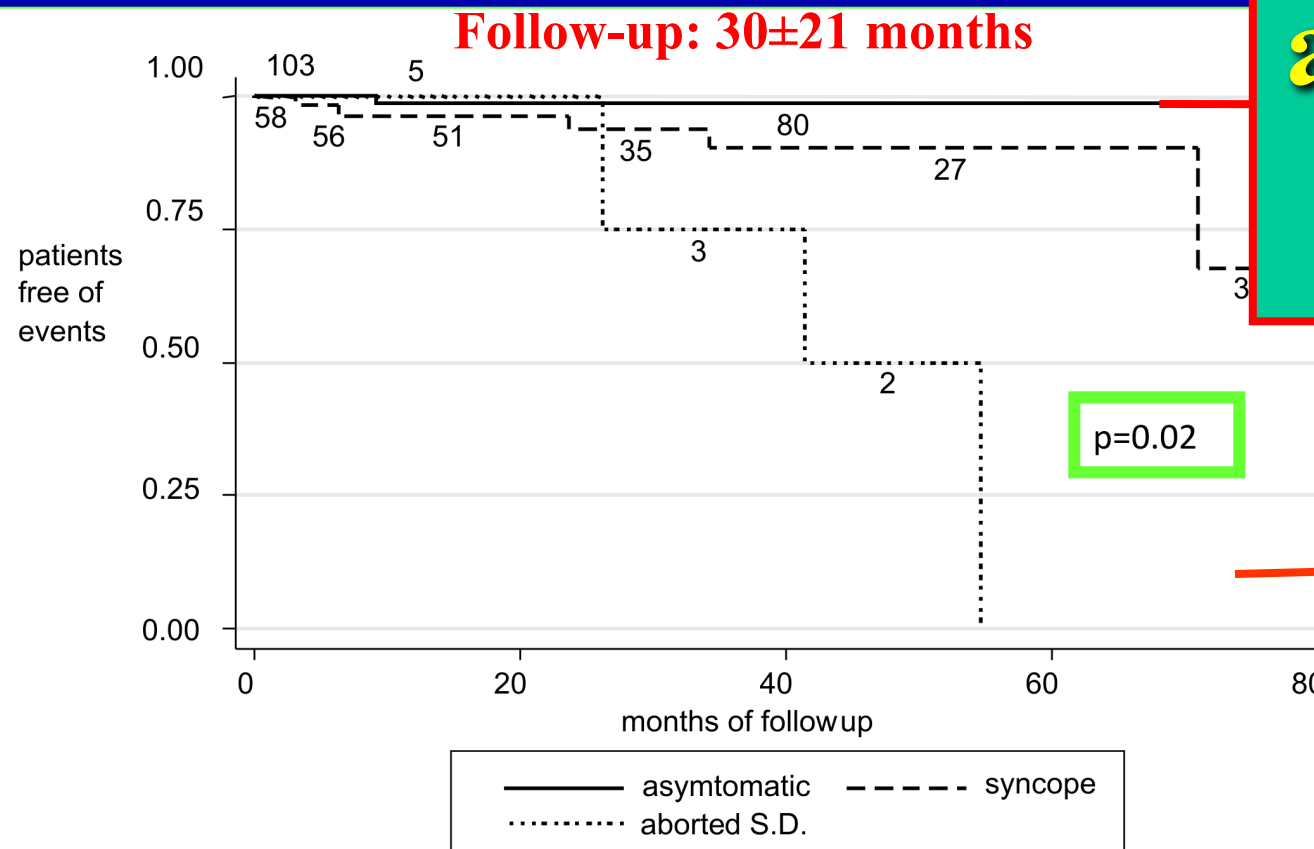
14/73 (8%/year)

44/71 (14%/year)

Risk stratification of the patients with Brugada type electrocardiogram: a community-based prospective study

Carla Giustetto^{1*}, Stefano Drago¹, Pier Giuseppe Demarchi², Paola Dalmasso³, Francesca Bianchi⁴, Andrea Sibona Masi⁵, Paula Carvalho⁶, Eraldo Occhetto⁷, Guido Rossetti⁸, Riccardo Riccardi⁴, Roberta Bertona⁹, Fiorenzo Gaita¹, and
On behalf of the Italian Association of Arrhythmology and Cardiac Stimulation (AIAC)—Piedmont Section

Europace 2009; 11 (4): 507-13



asymptomatic
0.5% - year

3% -year

**cardiac
arrest**

17% -year

Long-Term Prognosis of Patients Diagnosed With Brugada Syndrome

Results From the FINGER Brugada Syndrome Registry

Circulation. 2010;121



V. Probst, MD, PhD, C. Veltmann, MD, L. Eckardt, MD, P.G. Meregalli, MD, F. Gaita, MD, H.L. Tan, MD, PhD, D. Babuty, MD, PhD, F. Sacher, MD, C. Giustetto, MD, E. Schulze-Bahr, MD, PhD, M. Borggrefe, MD, PhD, M. Haissaguerre, MD, P. Mabo, MD, PhD, H. Le Marec, MD, PhD, C. Wolpert, MD, PhD, and A.A.M. Wilde, MD, PhD

risk stratification based on Clinical Presentation

1029 pts
51 (5%) had S.D or aSD
(f-up32 months)

Asymptomatic
Syncope (2 % /y

asymptomatic

0.5% - year

Cardiac arrest (8%/y)

A **spontaneous** Brugada type 1 ECG pattern
or
only induced with a pharmacological test,
do they have the same
prognostic significance ???

Long-Term Prognosis of Patients Diagnosed With Brugada Syndrome

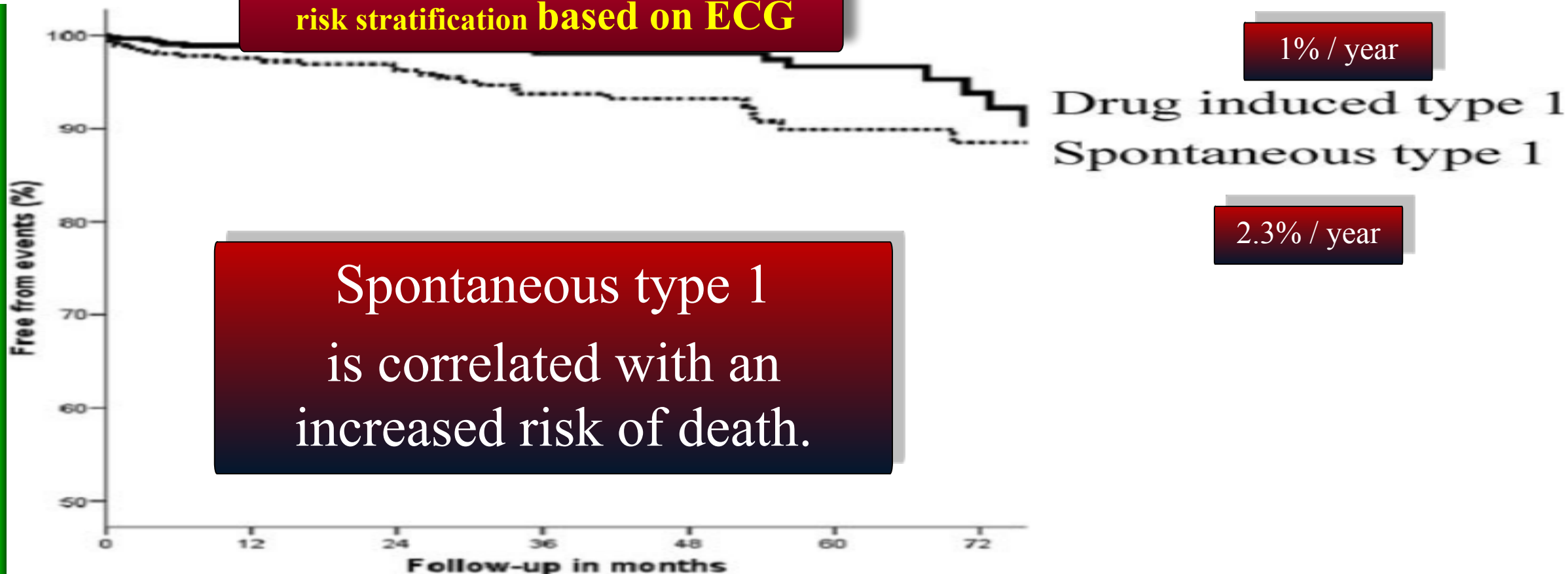
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risk stratification based on ECG



Brugada ECG
« Signature is Dynamic» ECG pattern

The major limitation of this study is linked to the fact that

**the stratification between
spontaneous type 1 and induced type 1
was made on the basis of a few ECG
(on average 3)**

Prevalence of Type 1 Brugada Electrocardiographic Pattern Evaluated by Twelve-Lead Twenty-Four-Hour Holter Monitoring



Am J Cardiol 2015; 115: 52-56

Natascia Cerrato, MD^a, Carla Giustetto, MD^{a,*}, Elena Gribaudo, MD^a, Elena Richiardi, MD^b,
Lorella Barbonaglia, MD^c, Chiara Scrocco, MD^a, Domenica Zema, MD^a, and Fiorenzo Gaita, MD^a

Brugada Piedmont Registry **684 patients**

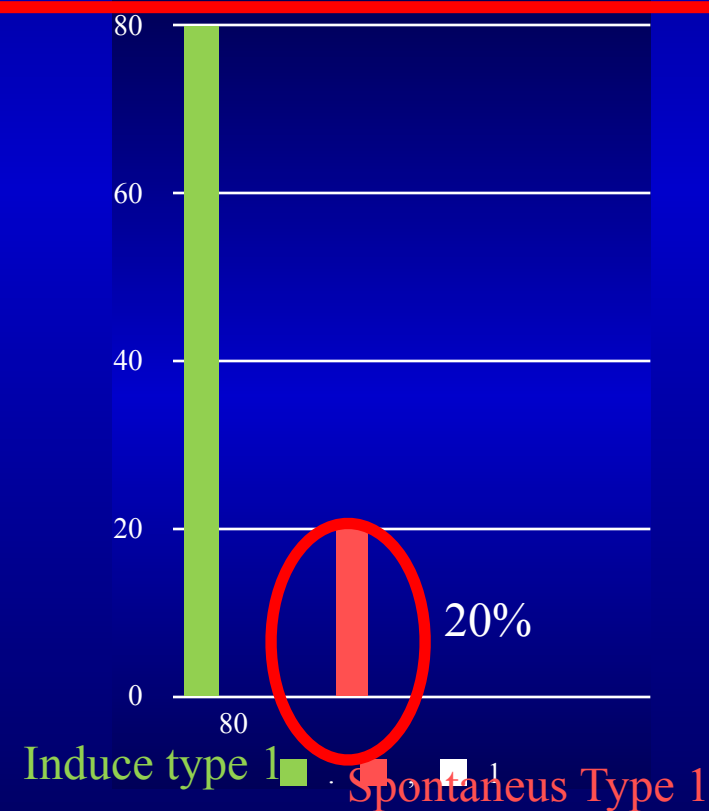
12 Lead ECG **684 pts**



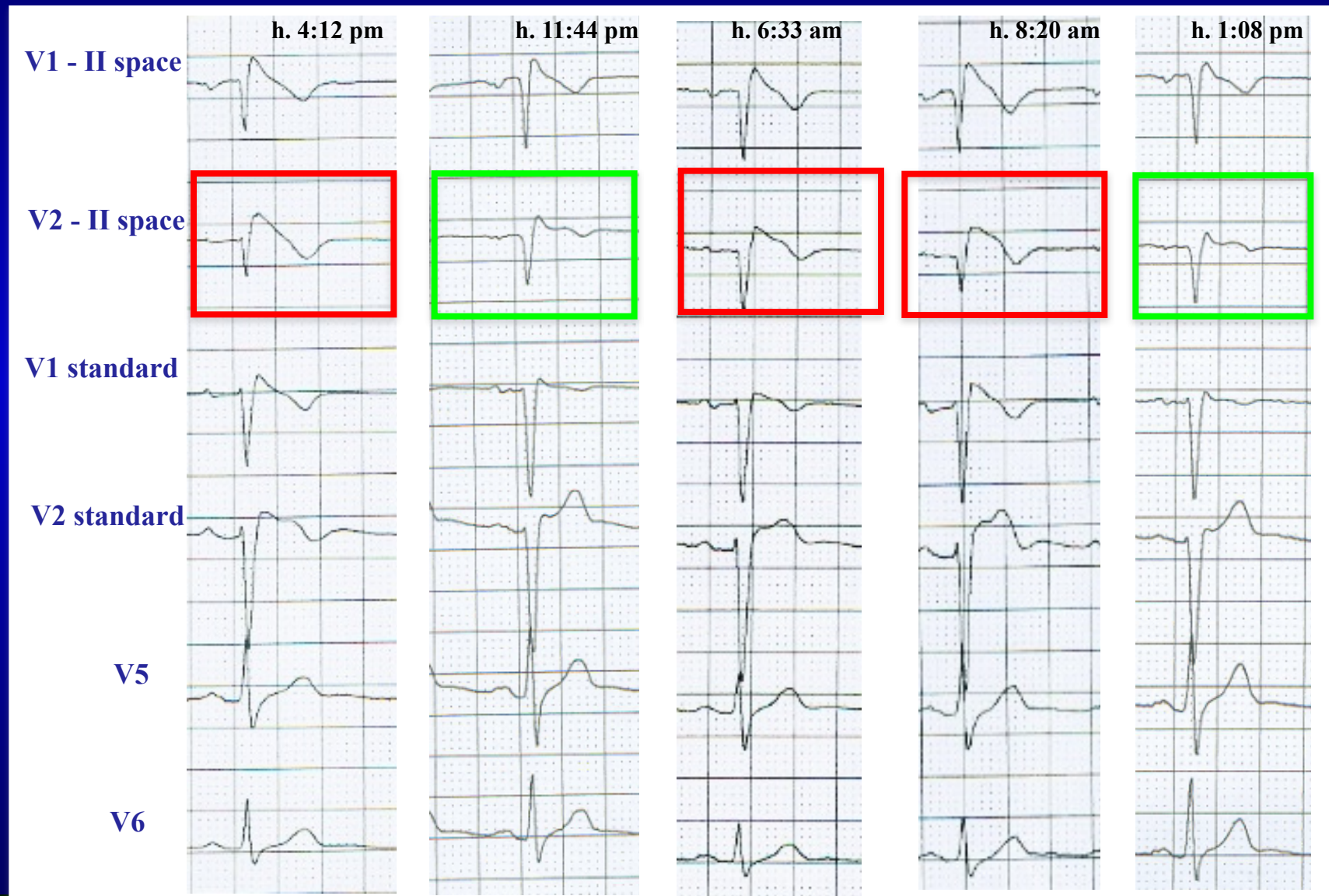
■ spontaneous type 1 at
basal ECG (group 1)

■ drug-induced type 1
(group 2)

12 Lead 24 hour Holter
in **drug-induced type 1**

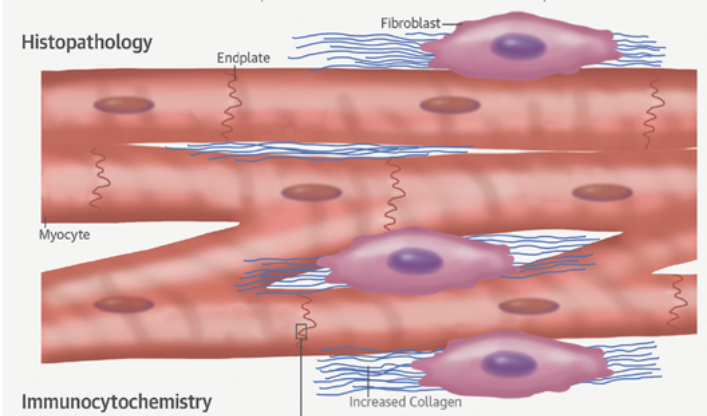


12-lead 24-hour Holter monitoring showed presence of intermittent spontaneous type 1 Brugada pattern

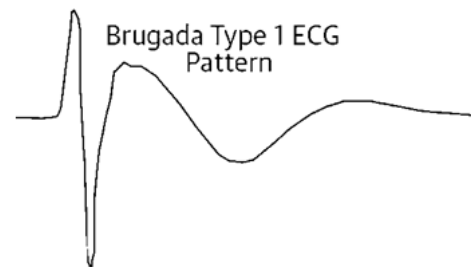


ECG markers of risk in Brugada patients

Spontaneous type 1



Fibrosis and reduction of connexin-43



PR prolonged
R wave in AVR
S wave in D1
QRS fragmentation
QRS duration ≥ 110 ms
Inferior type 1
dST-Tiso
Early repolarization

A New Electrocardiographic Marker of Sudden Death in Brugada Syndrome

The S-Wave in Lead I

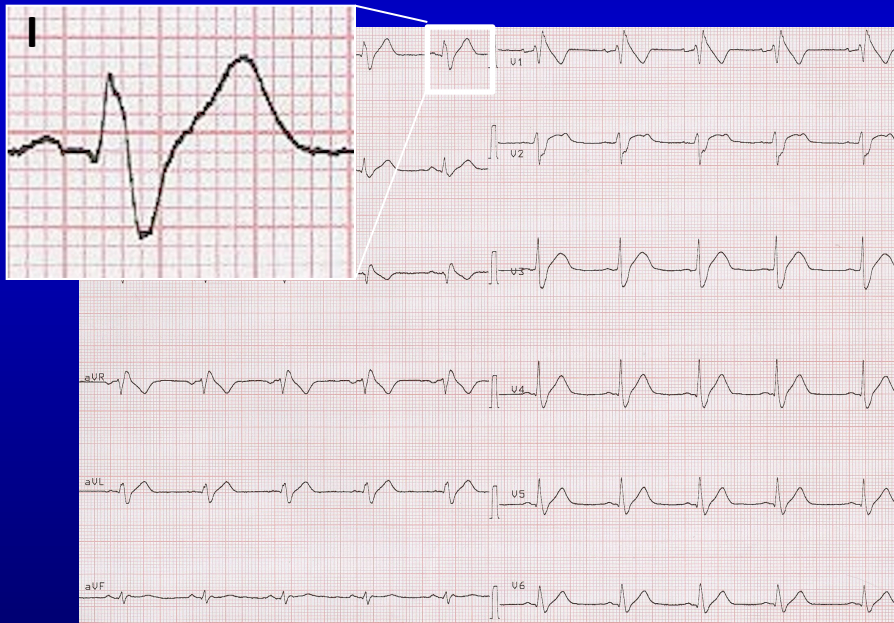
Leonardo Calò, MD,^a Carla Giustetto, MD,^b Annamaria Martino, MD,^a Luigi Sciarra, MD,^a Natascia Cerrato, MD,^b Marta Marziali, MD,^a Jessica Rauzino, MD,^c Giulia Carlino, MD,^d Ermenegildo de Ruvo, MD,^a Federico Guerra, MD,^e Marco Rebecchi, MD,^a Chiara Lanzillo, MD, PhD,^a Matteo Anselmino, MD,^b Antonio Castro, MD,^f Federico Turreni, MD,^f Maria Penco, MD,^d Massimo Volpe, MD,^c Alessandro Capucci, MD,^e Fiorenzo Gaita, MD^b



JACC
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

J Am Coll Cardiol. 2016

347 patients all with spontaneous type 1 ECG; mean follow-up 48 months



S-wave in lead I:

- ≥ 0.1 mV (amplitude)
- ≥ 40 ms (duration)
- ≥ 1 mm² (area)

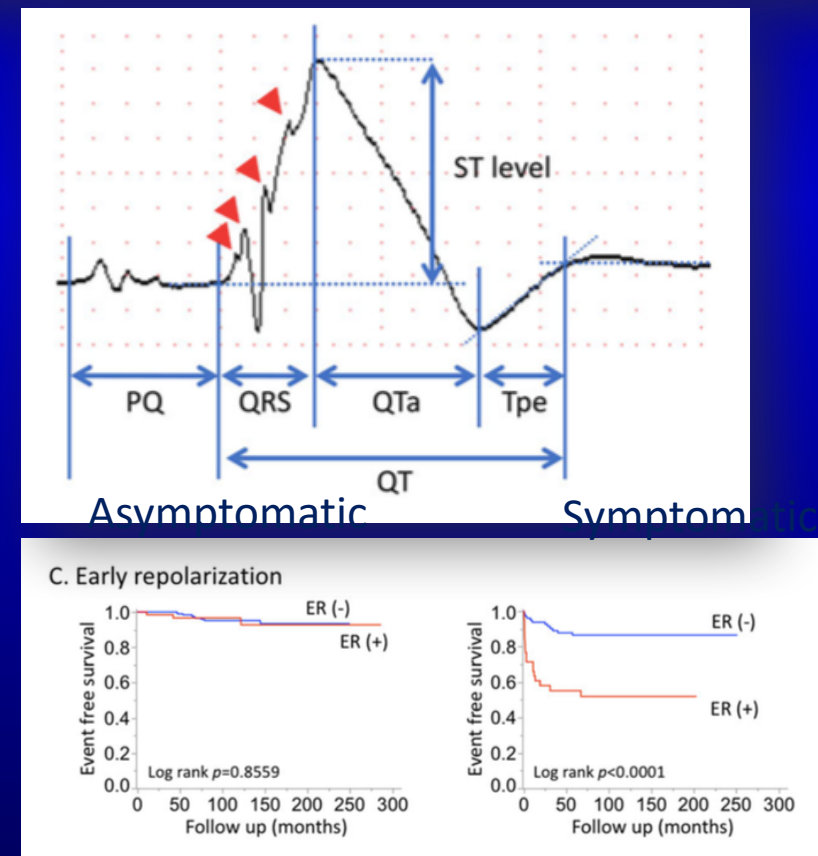
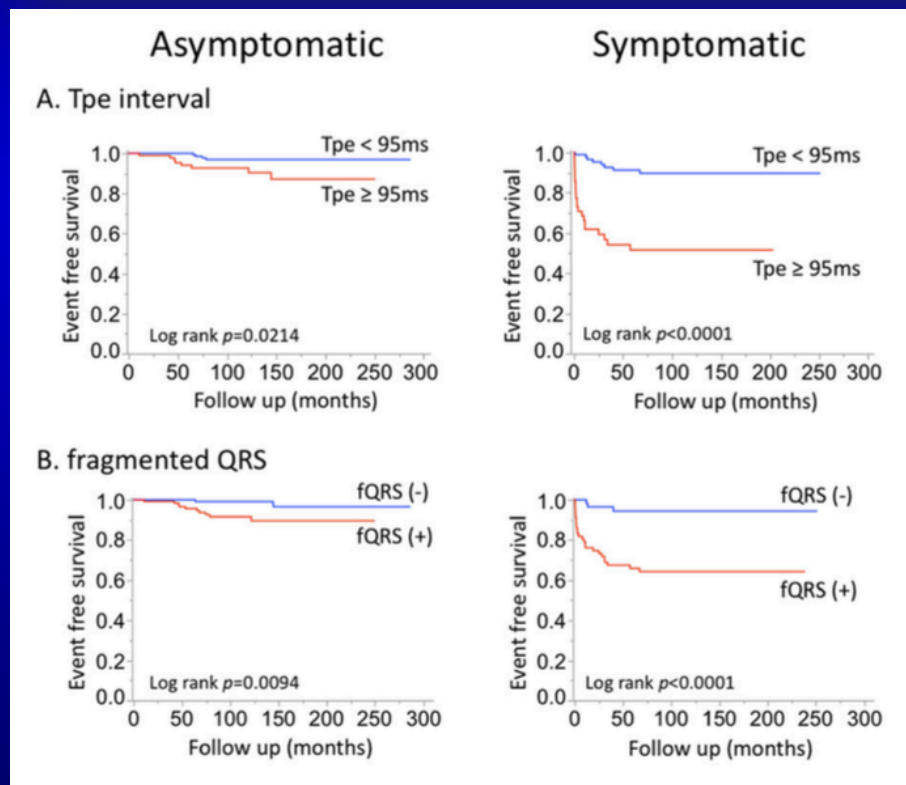
S-wave was present in all but 1 of those who had VF/SCD (96.9%)... but also in 59% of the remaining population

Identification of electrocardiographic risk markers for the initial and recurrent episodes of ventricular fibrillation in patients with Brugada syndrome

Abstract

Introduction: New onset of ventricular fibrillation (VF) in asymptomatic patients with Brugada-type ECG is not frequent, but it cannot be negligible. Risk markers for predicting VF are usu-

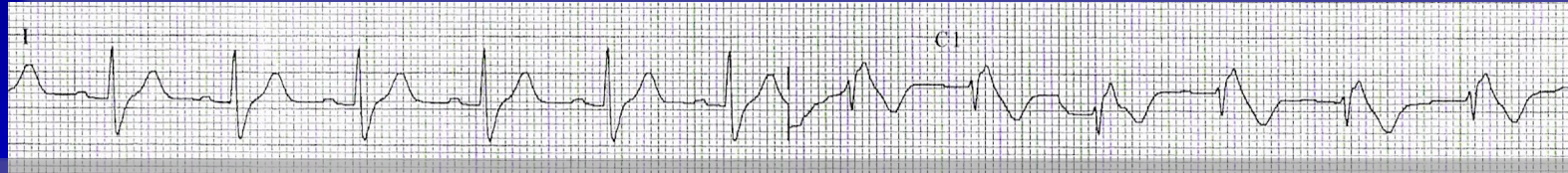
Nobuhiro Nishii MD, PhD¹ | Kazufumi Nakamura MD, PhD² | Hiroshi Ito MD, PhD²



Ventricular conduction delay as marker of risk in Brugada Syndrome.
Results from the analysis of clinical and electrocardiographic features of a large cohort of patients☆☆☆

Carla Giustetto ^{a,*,1}, Giulia Nangeroni ^{a,1}, Natascia Cerrato ^{a,1}, Boris Rudic ^{b,c}, Erol Tülümen ^{b,c}, Elena Gribaudo ^a, Daniela Francesca Giachino ^d, Lorella Barbonaglia ^e, Lorenza Michela Biava ^a, Paula Carvalho ^f, Laura Bergamasco ^a, Martin Borggreffe ^{b,c}, Fiorenzo Gaita ^a

We analyzed ECG of 614 Brugada pts



The arrhythmic risk is related not only to the symptoms at presentation, but also to the presence of a
ventricular conduction delay:

QRS duration ≥ 110 ms

S wave duration ≥ 40 ms

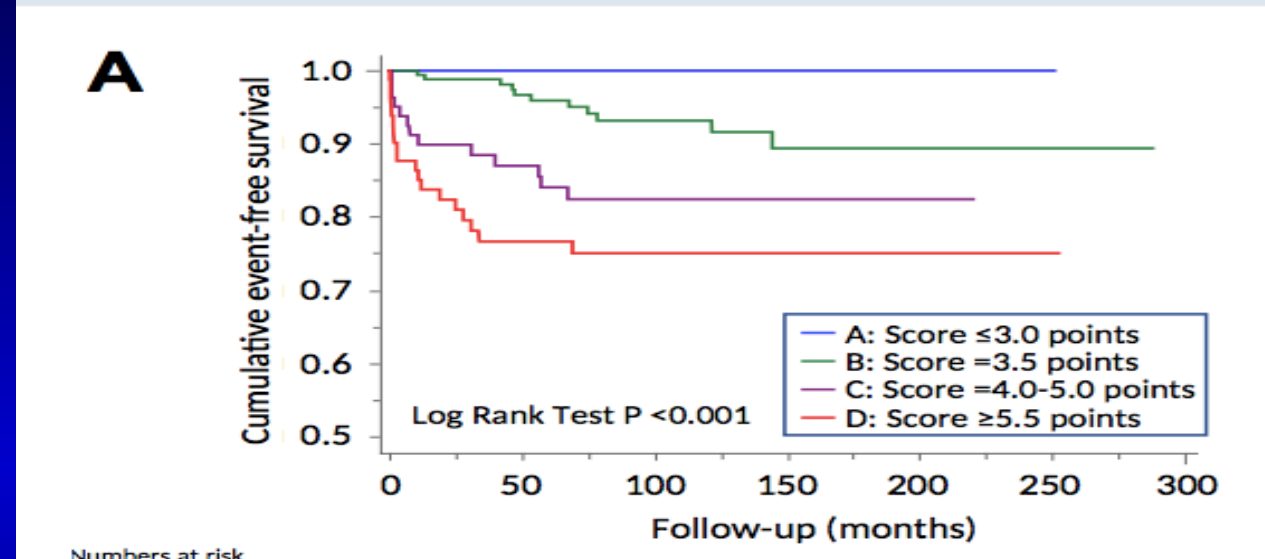


SHANGHAI SCORE SYSTEM

TABLE 1 Proposed Shanghai Score System for Diagnosis of Brugada Syndrome (6)

	Points
I. ECG* (12-lead/ambulatory)	
A. Spontaneous type 1 Brugada ECG pattern at nominal or high leads	3.5
B. Fever-induced type 1 Brugada ECG pattern at nominal or high leads	3
C. Type 2 or 3 Brugada ECG pattern that converts with provocative drug challenge	2
II. Clinical history†	
A. Unexplained cardiac arrest or documented VF/polymorphic VT	3
B. Nocturnal agonal respirations	2
C. Suspected arrhythmic syncope	2
D. Syncope of unclear mechanism/unclear etiology	1
E. Atrial flutter/fibrillation in patients <30 yrs without alternative etiology	0.5
III. Family history	
A. First- or second-degree relative with definite BrS	2
B. Suspicious SCD (fever, nocturnal, Brugada aggravating drugs) in a first- or second-degree relative	1
C. Unexplained SCD <45 yrs in first- or second-degree relative with negative autopsy	0.5
IV. Genetic test result	
A. Probable pathogenic mutation in BrS susceptibility gene	0.5

FIGURE 2 Cumulative Event-Free Survival as a Function of Score



10-year event frequency :

- Group A (score: 3.0) 0%
- Group B (score: 3.5) 6.8%
- Group C (score: 4.0-5.0) 17.6%
- Group D (score: 5.5) 25%

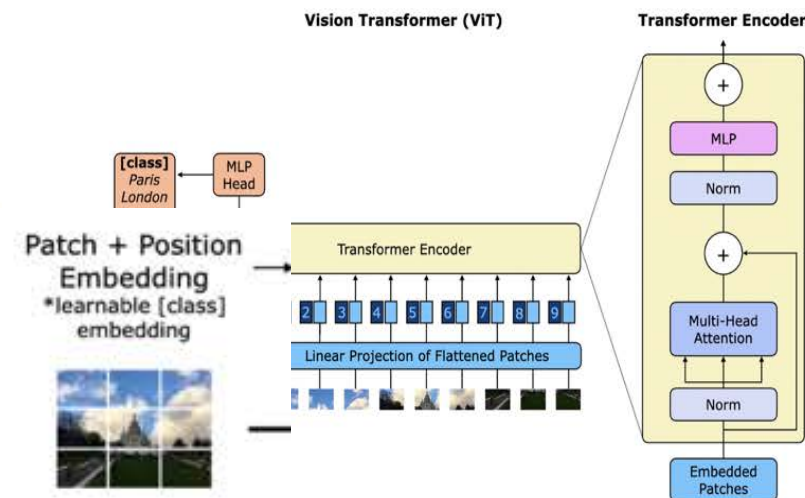
A Vision Transformer Model for the Prediction of Fatal Arrhythmic Events in Patients with Brugada Syndrome

Vincenzo Randazzo ^{1,*}, Silvia Caligari ¹, Eros Pasero ^{1,*}, Carla Giustetto ^{2,3,*}, Andrea Saglietto ^{2,3}, William Bertarello ^{2,3}, Amir Averbuch ⁴, Mira Marcus-Kalish ⁵, Valery Zheludev ⁴ and Fiorenzo Gaita ^{3,6}



- ¹ Department of Electronics and Telecommunications (DET), Politecnico di Torino, 10129 Turin, Italy
- ² Division of Cardiology, Città della Salute e della Scienza Hospital, 10126 Turin, Italy
- ³ Department of Medical Sciences, University of Turin, 10122 Turin, Italy
- ⁴ School of Computer Science, Tel Aviv University, Tel Aviv 6997801, Israel
- ⁵ Department of Statistics and Operations, Tel Aviv University, Tel Aviv 6997801, Israel
- ⁶ J Medical, Cardiology Unit, 10151 Turin, Italy

Sensor 30 January 2025



Hierarchical Attention Multiple Instance Learning Model for Brugada Syndrome Detection in ECG Signals

Vincenzo Randazzo *Member IEEE*, Alessandro Casella *Graduate Student Member IEEE*, Silvia Caligari *Member IEEE*, Carla Giustetto *Member IEEE*, Eros Pasero *Senior Member, and Fiorenzo Gaita*

INPRESS

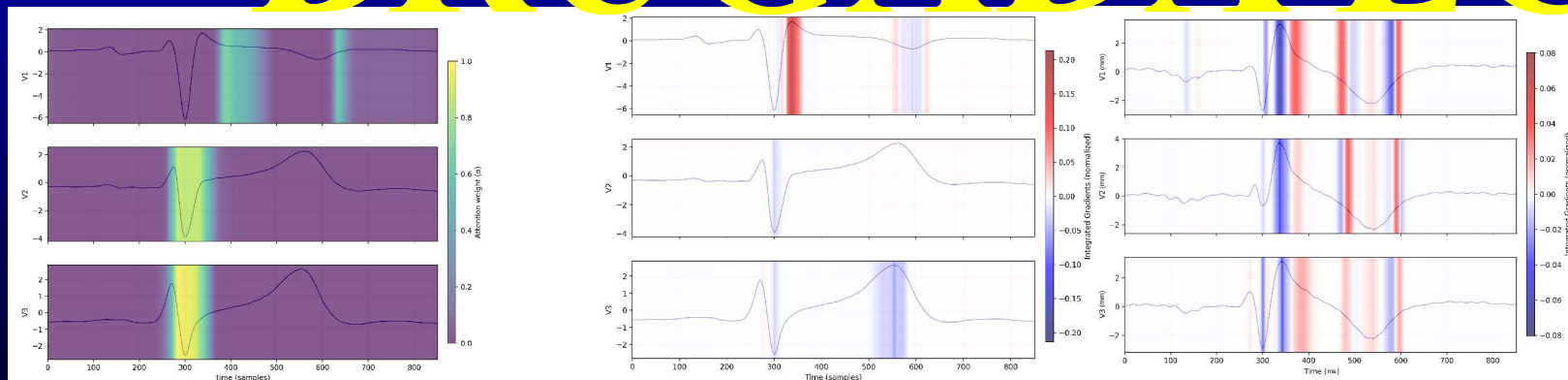
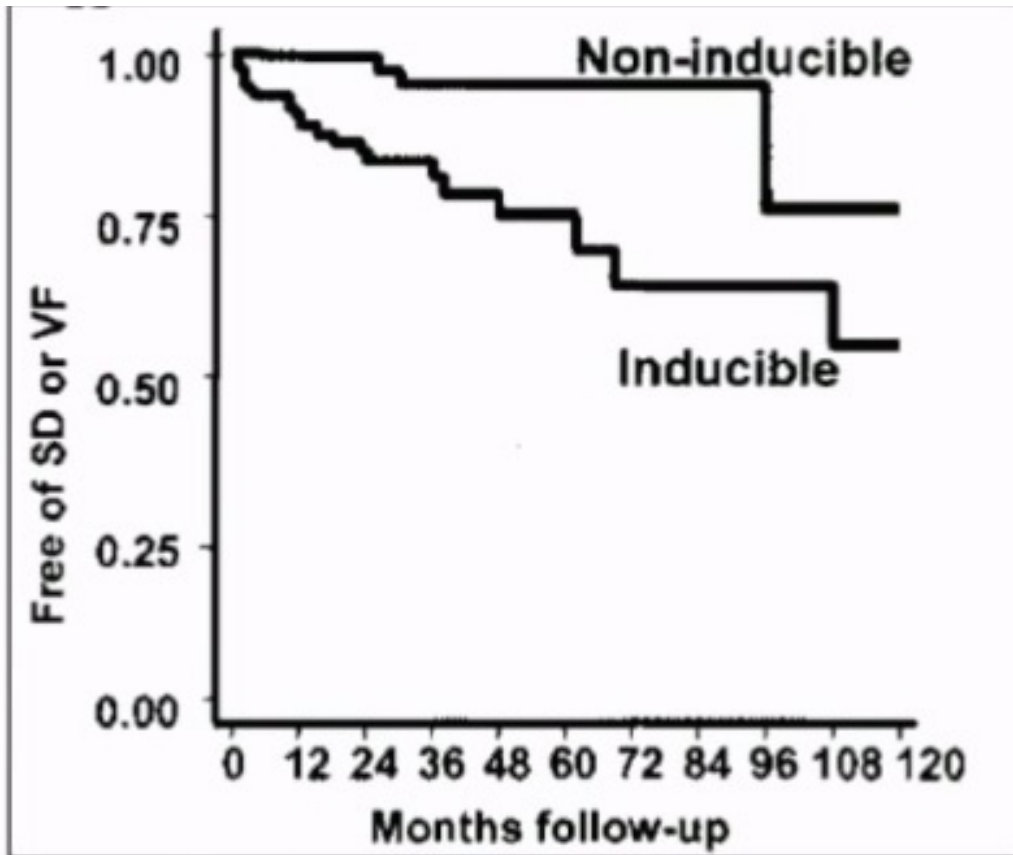
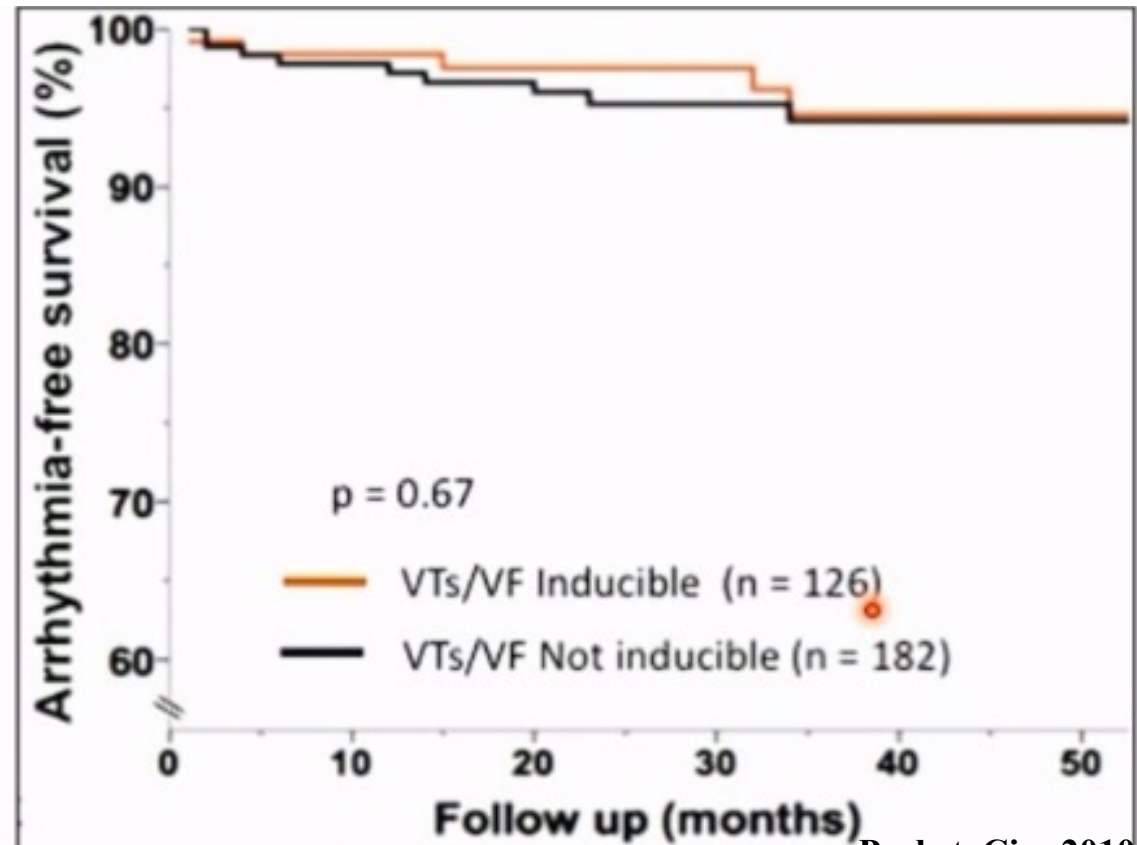


Fig. 3. Block diagram of the proposed hierarchical MIL architecture.

The role of electrophysiological study in risk stratification in pts with Brugada-type ECG



Brugada J, Circ 2003
Giustetto, Europace 2009



Probst, Circ 2010

Eckart, Circ 2005

Priori S, JACC 2012

Asymptomatic Patients With Brugada ECG Pattern: Long-Term Prognosis From a Large Prospective Study

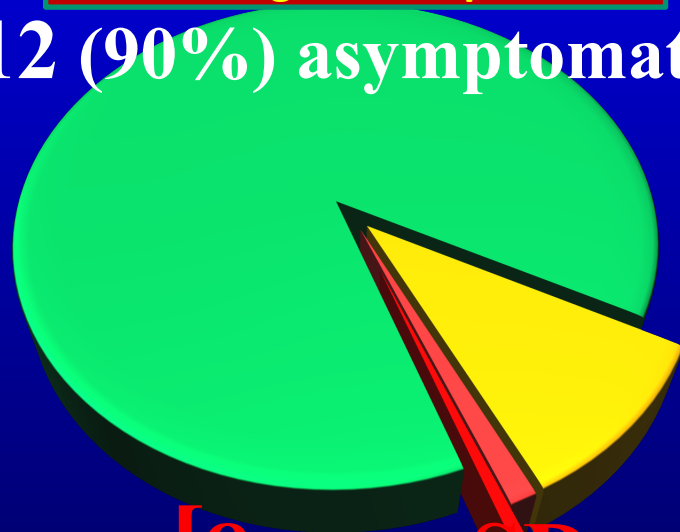


Circulation. 2023;148

Fiorenzo Gaita^{ID}, MD*; Natascia Cerrato^{ID}, MD*; Carla Giustetto^{ID}, MD*; Annamaria Martino, MD, PhD; Laura Bergamasco, PhD; Michele Millesimo^{ID}, MD; Lorella Barbonaglia, MD; Paula Carvalho, MD; Domenico Caponi, MD; Andrea Saglietto^{ID}, MD; Giacomo Bonacchi, MD; Francesca Bianchi, MD; Elisa Silvetti, MD; Cinzia Crescenzi, MD; Stefano Canestrelli, MD; Melissa De Maio, MD; Gaetano Maria De Ferrari, MD; Giuseppe Musumeci, MD; Francesco Ramella, MD; Marco Scaglione, MD; Leonardo Calò, MD^{ID}

1669 pts
with Brugada ECG pattern

1512 (90%) asymptomatic



[8 (0.7%) SD] **21 (1.2%) aSD]**

average age 30 yrs

An asymptomatic pts remains asymptomatic until he becomes symptomatic

128 (8%) syncope unexplainable

157 pts 10% Symptomatic

First therapeutic step

in ALL the patients with Brugada ECG pattern

Avoid drugs that may increase the ST segment elevation

www.brugadadrugs.org

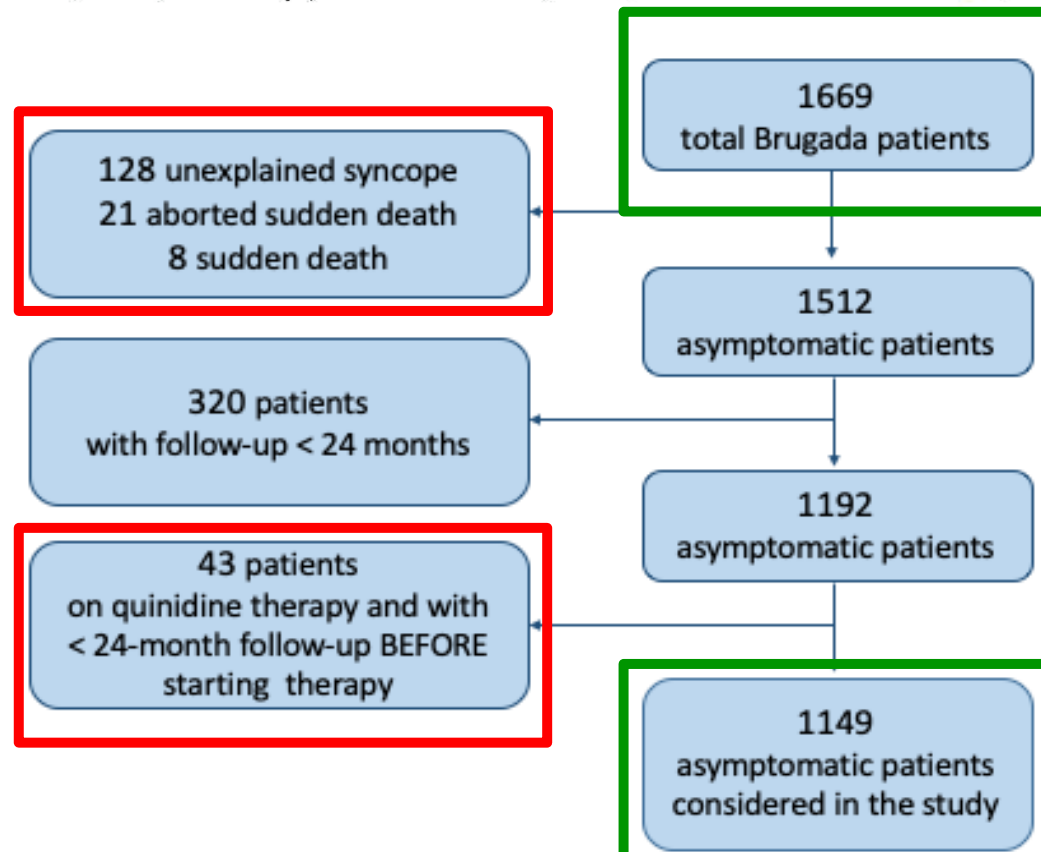
Drug-Induced Brugada-Like ECG Patterns	
Antiarrhythmic drugs	Psychotropic drugs
Na ⁺ channel blockers	Tricyclic antidepressants ²¹⁶
Class IC drugs (Flecainide, ^{12,15,142,207,208}	Amitriptyline, ^{217,218} Nortriptyline, ¹⁵¹ Desipramine, ¹⁴⁹
Pilsicainide, ^{148,209} Propafenone ²¹⁰)	Clomipramine ¹⁵⁰
Class IA drugs (Ajmaline, ^{12,211} Procainamide, ^{12,13}	Tetracyclic antidepressants
Disopyramide, ^{4,13} Cibenzoline ^{212,213})	Maprotiline ²¹⁷
Ca ²⁺ channel blockers	Phenothiazine
Verapamil	Perphenazine, ²¹⁷ Cyamemazine.
β -Blockers	Selective serotonin reuptake inhibitors
Propranolol intoxication ²¹⁴	Fluoxetine ²¹⁸
Antianginal drugs	Lithium ¹⁵⁷
Ca ²⁺ channel blockers	Other drugs
Nifedipine, diltiazem	Histaminic H1 receptor antagonists
Nitrate	Dimenhydrinate ¹⁵²
Isosorbide dinitrate, nitroglycerine ²¹⁵	Diphenhydramine ²¹⁹
K ⁺ channel openers	Cocaine intoxication ^{153,220}
Nicorandil	Alcohol intoxication
	Modified from Antzelevitch et al. ⁵⁶ and Shimizu ²²¹ with permission.

Promptly treat fever

Asymptomatic Patients With Brugada ECG Pattern: Long-Term Prognosis From a Large Prospective Study



Fiorenzo Gaita^{ID}, MD*; Natascia Cerrato^{ID}, MD*; Carla Giustetto^{ID}, MD*; Annamaria Martino, MD, PhD; Laura Bergamasco, PhD; Michele Millesimo^{ID}, MD; Lorella Barbonaglia, MD; Paula Carvalho, MD; Domenico Caponi, MD; Andrea Saglietto^{ID}, MD; Giacomo Bonacchi, MD; Francesca Bianchi, MD; Elisa Silvetti, MD; Cinzia Crescenzi, MD; Stefano Canestrelli, MD; Melissa De Maio, MD; Gaetano Maria De Ferrari, MD; Giuseppe Musumeci, MD; Francesco Ramella, MD; Marco Scaglione, MD; Leonardo Calò, MD^{ID}



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Management of **1149 asymptomatic** patients

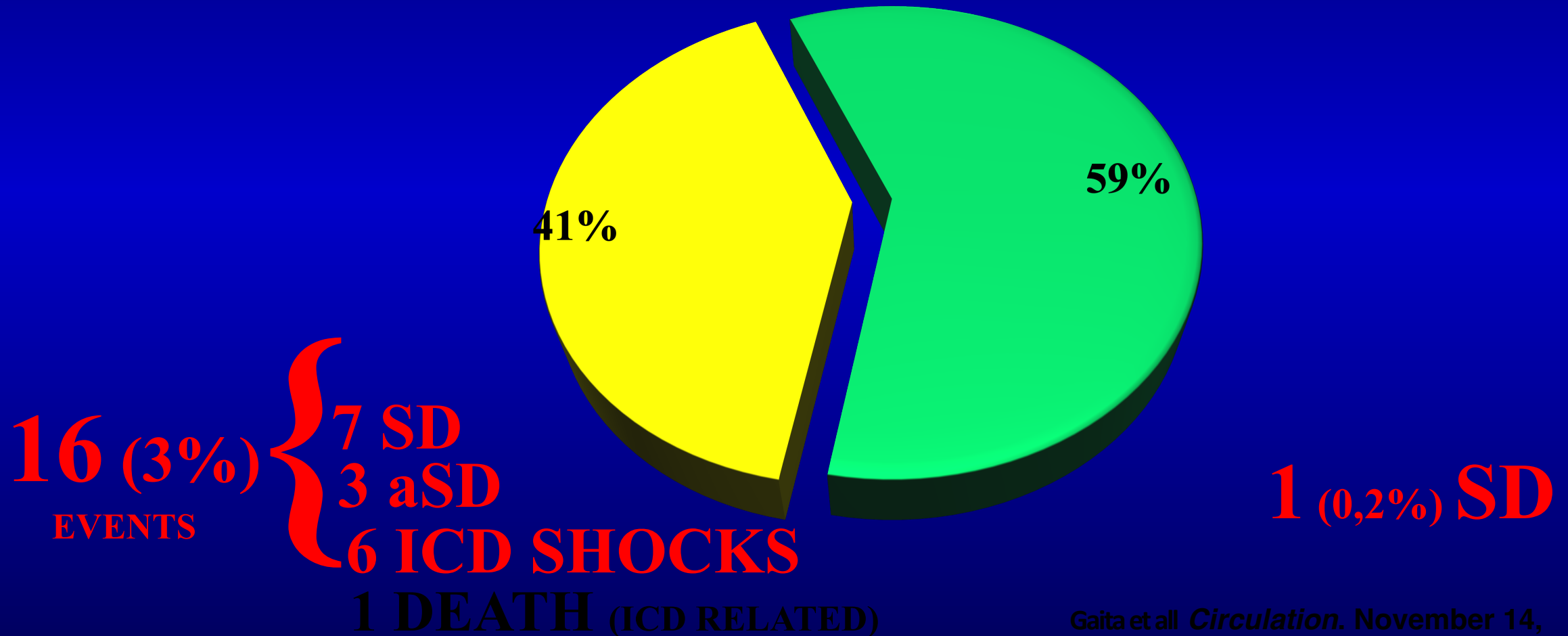
610 pts with **drug-induced type 1 ECG** pattern

Multiple ECGs (at least once a year) and 12 Lead 24 hour Holter
it has been proposed to exclude a spontaneous type-1 BrECG

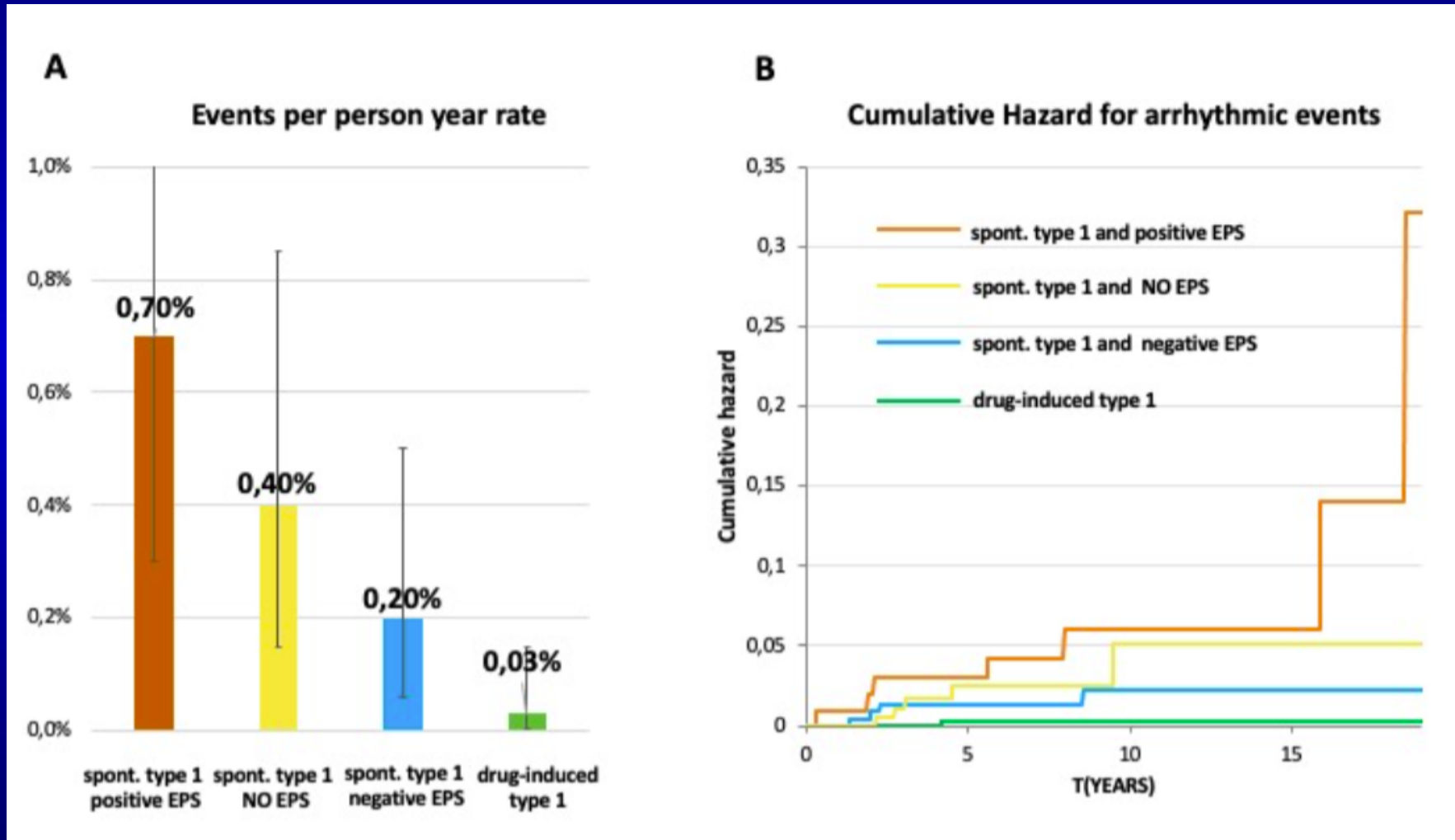
539 pts with **spont-type-1 BrECG**

an EPS was proposed
and if positive a therapy was suggested

Arrhythmic risk in 1149 asymptomatic pts with Brugada syndrome: the role of spontaneous type 1 ECG



Arrhythmic risk in asymptomatic Brugada pts (role of EPS in pts with spontaneus-Type 1 ECG)

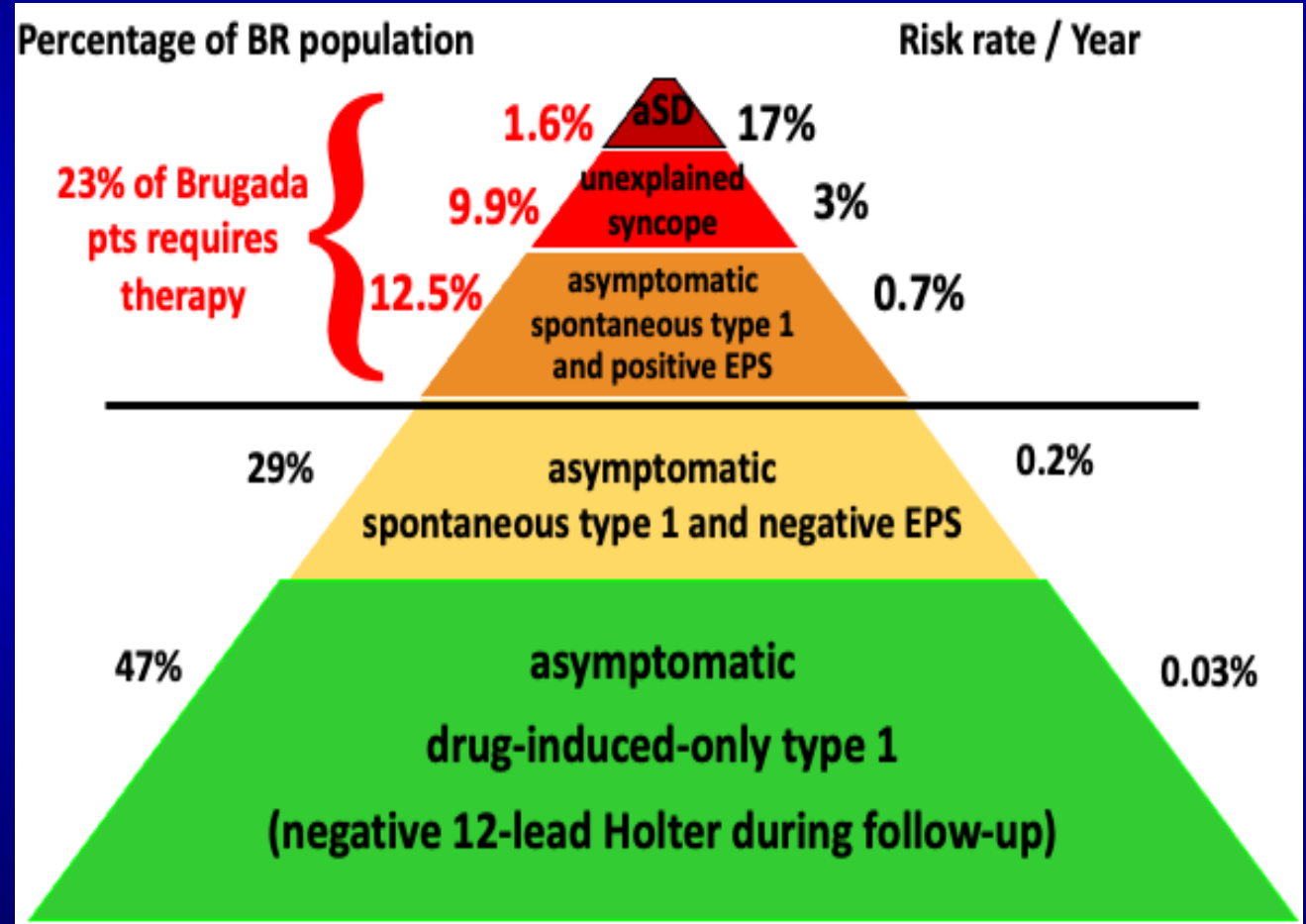


RISK FACTORS FOR SCD IN BRUGADA PATIENTS

★ aSCD

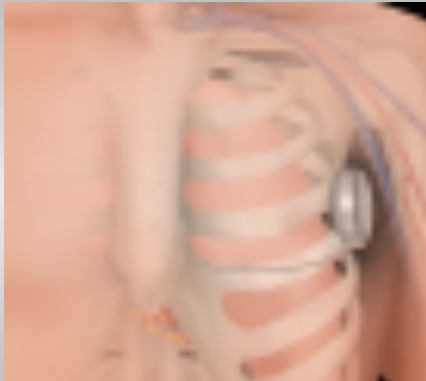
★ Arrhythmic
Syncope

★ Asymptomatic with
Spontaneous ECG pattern
and EPS positive (with 2 extra)



**The still open question is not
“To treat or not to treat these patients” ?
but
how to treat these patients?**

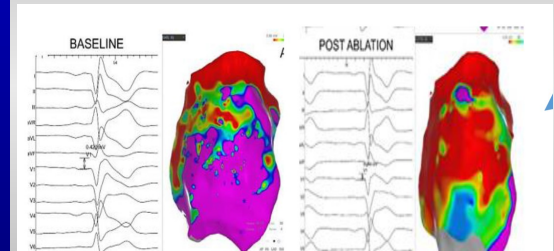
SICD



**Drug therapy
Quinidine**

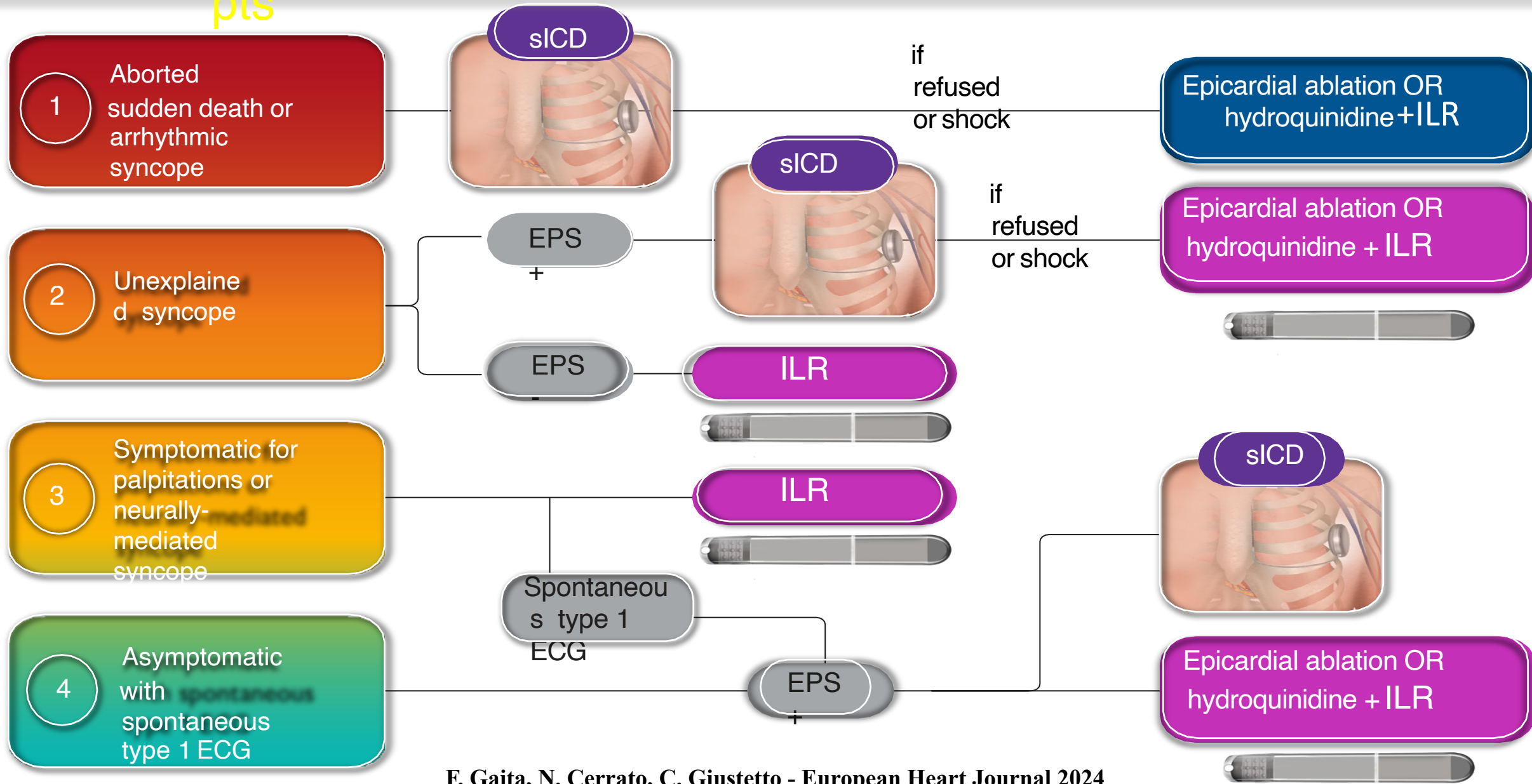


Catheter Ablation



Proposed indications for risk stratification and therapeutic management in E

pts



Thanks for your attention!

