Σύνδρομο Brugada

Χρήστος Θ. Σεφερλής

Καρδιολόγος – Ηλεκτροφυσιολόγος

401 ΓΣΝΑ

Clinical Study | November 1992

Right bundle branch block, persistent ST segment elevation and sudden cardiac death: A distinct clinical and electrocardiographic syndrome
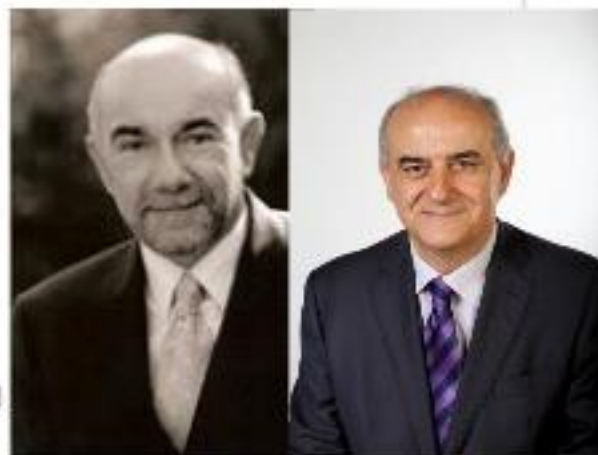
A multicenter report

FREE

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Σύνδρομο Brugada

Χαρακτηρίζεται από :

- Αιφνίδιο καρδιακό θάνατο κατά την διάρκεια του ύπνου ή της ανάπαυσης
- Απουσία <u>εμφανούς</u> δομικής καρδιοπάθειας
- Χαρακτηριστικό ΗΚΓ

Σύνδρομο Brugada

- Ευθύνεται για το 20-30% των αιφνιδίων θανάτων ανθρώπων άνευ δομικής καρδιοπάθειας.
- Συχνότερο αίτιο θανάτου ανδρών < 50 ετών στην Ασία:
  - Philippines: Bangungut = scream followed by sudden death during sleep
  - Thailand: Lai tai = death during sleep
  - Japan: Pokuri = unexpected death during sleep
- Κληρονομείται κατά τον αυτοσωματικό επικρατούντα χαρακτήρα με χαμηλή διεισδυτικότητα
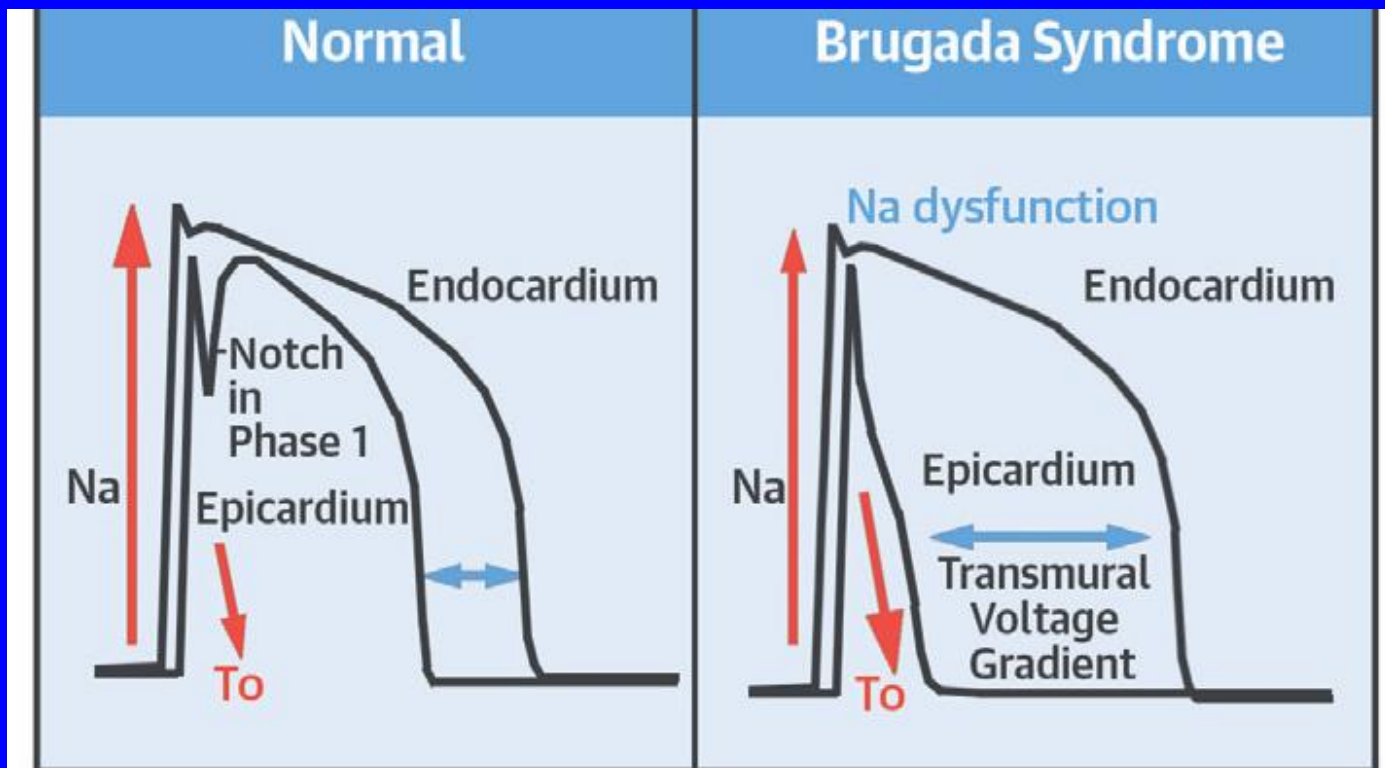- 8-10 φορές συχνότερο στους άνδρες

ΔΙΑΥΛΟΠΑΘΕΙΕΣ

(channelopathies / inherited primary arrhythmia syndromes)

Διαυλοπάθειες (channelopathies)

Ετερογενές σύνολο «ασθενειών» που προκύπτουν από την δυσλειτουργία διαύλων ιόντων οι οποίοι βρίσκονται στην κυτταρική μεμβράνη αλλά και σε ενδοκυττάρια σωματίδια.
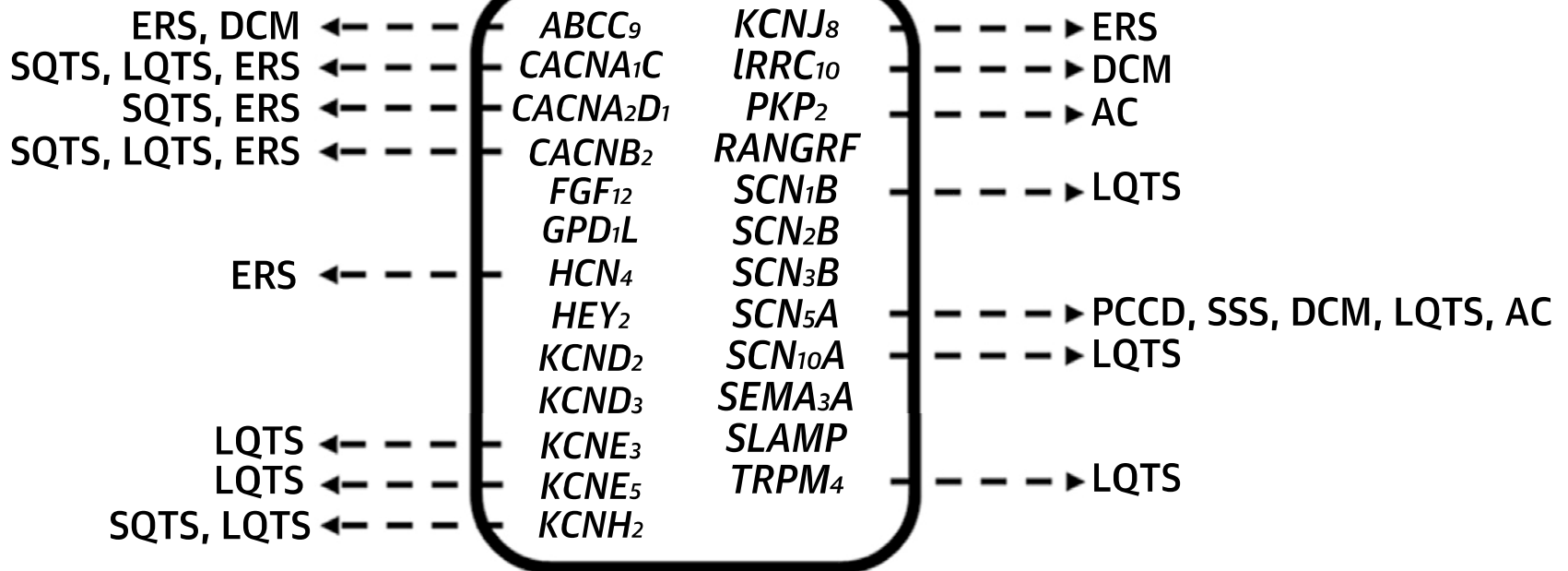
- Νευρικό σ. (υπο- και υπερ- καλιαιμική περιοδική παράλυση, κ.α.)

- Καρδιαγγειακό σ. (long QT, short QT, Brs, CPVT, κ.α.)

- Αναπνευστικό (κυστική ίνωση, κ.α)

- Ουροποιητικό σ. (σ. Bartter, νεφρογενής άποιος διαβήτης, κ.α.)

- Ανοσοποιητικό σ. (myasthenia gravis)

Μετάλλαξη στο γονίδιο SCN5A με αποτέλεσμα δυσλειτουργία των διαύλων Na⁺ (20% των περιπτώσεων)

BrS

ERS, DCM ← - - - — $ABCC_9$ $KCNJ_8$ — - - - → ERS

SQTS, LQTS, ERS ← - - - — $CACNA_1C$ $lRRC_{10}$ — - - - → DCM

SQTS, ERS ← - - - — $CACNA_2D_1$ PKP_2 — - - - → AC

SQTS, LQTS, ERS ← - - - — $CACNB_2$ $RANGRF$

FGF_{12} SCN_1B — - - - → LQTS

GPD_1L SCN_2B

ERS ← - - - — HCN_4 SCN_3B

HEY_2 SCN_5A — - - - → PCCD, SSS, DCM, LQTS, AC

$KCND_2$ $SCN_{10}A$ — - - - → LQTS

$KCND_3$ $SEMA_3A$

LQTS ← - - - — $KCNE_3$ $SLAMP$

LQTS ← - - - — $KCNE_5$ $TRPM_4$ — - - - → LQTS

SQTS, LQTS ← - - - — $KCNH_2$

Proposed diagnostic criteria for the Brugada syndrome: consensus report.

Wilde AA, Antzelevitch C, Borggrefe M, **Brugada** J, **Brugada** R, **Brugada** P, Corrado D, Hauer RN, Kass RS, Nademanee K, Priori SG, Towbin JA; Study Group on the Molecular Basis of Arrhythmias of the European Society of Cardiology.

ST Patterns in Brugada Syndrome

Type 1 "Coved Type"
- J wave ≥ 2mm convex
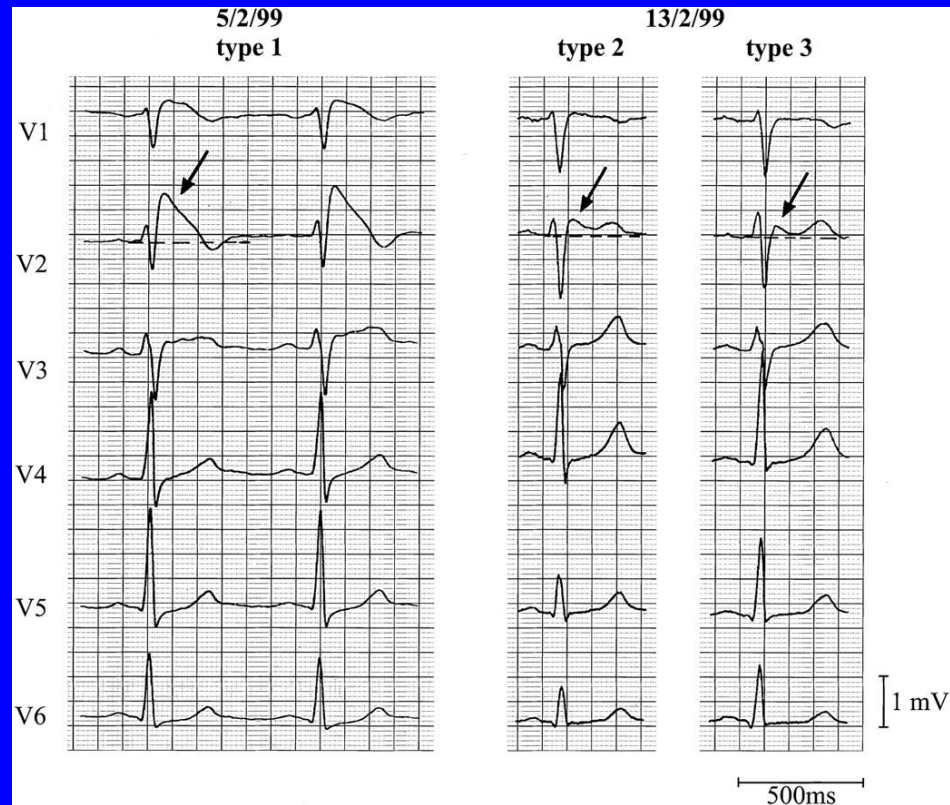- ST segment descends
- Inverted T wave

Type 2 "Saddle back"
- J wave ≥ 2mm
- ST segment ≥1mm
- Upright or biphasic T

Type 3 "Saddle back"
- J wave ≥2mm
- ST segment <1mm
- Positive T wave

Δυναμικές ΗΚΓφικες αλλαγές στον ίδιο ασθενή

ΦΑΡΜΑΚΕΥΤΙΚΗ ΠΡΟΚΛΗΣΗ
(ajmaline 1mg/kg, flecainide 2mg/kg, procainamide 10mg/kg)

TABLE 2. Abnormalities That Can Lead to ST-Segment Elevation in the Right Precordial Leads

Right or left bundle branch block, left ventricular hypertrophy[28]

Acute myocardial ischemia or infarction[29]

Acute myocarditis[30]

Right ventricular ischemia or infarction[31]

Dissecting aortic aneurysm[32]

Acute pulmonary thromboemboli[33]

Various central and autonomic nervous system abnormalities[34,35]

Heterocyclic antidepressant overdose[36]

Duchenne muscular dystrophy[37]

Friedreich's ataxia[38]

Thiamine deficiency[39,40]

Hypercalcemia[41]

Hyperkalemia[42]

Cocaine intoxication[43,44]

Mediastinal tumor compressing RVOT[45]

Arrhythmogenic right ventricular dysplasia/cardiomyopathy[24,25]

Long-QT syndrome, type 3[11,12]

Other conditions that can lead to ST-segment elevation in the right precordial leads

Early repolarization syndrome

Other normal variants (particularly in men)[26]

Whereas the last 2 "other conditions that can lead to ST-segment elevation" are more likely to give rise to type 2 and type 3 ECGs, most conditions mentioned in this table can give rise to type 1 ECG.

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

Bayés de Luna A, **Brugada** J, Baranchuk A, Borggrefe M, Breithardt G, Goldwasser D, Lambiase P, Riera AP, Garcia-Niebla J, Pastore C, Oreto G, McKenna W, Zareba W, **Brugada** R, **Brugada** P.

Table 1
Electrocardiogram alterations in Brugada syndrome

A. ECG diagnostic criteria
Changes in precordial leads.

1. Morphology of QRS-T in V1-V3. ST elevation (sometimes only in V1 and exceptionally also in V3) (BrP)

Type 1. Coved pattern: initial ST elevation ≥ 2 mm, slowly descending and concave or rectilinear with respect to the isoelectric baseline, with negative symmetric T wave (see other characteristics in Table 2 and text).

Type 2. Saddle back pattern: The high take-off (r`) is ≥ 2 mm with respect to the isoelectric line and is followed by ST elevation; convex with respect to the isoelectric baseline with elevation ≥ 0.05 mV with positive/flat T wave in V2 and T wave variable in V1. If there is some doubt (ie, r' <2 mm), it is necessary to record the ECG in 2nd, 3rd ICS. Other characteristics may be seen in Table 2 and text.

2. New ECG criteria:

a. Corrado index (2010): Ratio high take-off of QRS-ST/height of ST at 80 ms later is in V1-V2 >1 because the ST is downsloping. In athletes, the ST especially in V2 is upsloping; and the index is <1. The end of QRS (J point) often does not coincide with the high take-off of QRS-ST as was suggested by Corrado.[36] However, using the high take-off of QRS-ST for the application of the Corrado index is valid for discriminating BrP and other conditions mimicking BrP.

b. The β angle formed by ascending S and descending r' is >58º in type 2 BrP (in athletes, it is much lower) (Chevalier et al. 2011) (SE 79% SP:84%).

c. Duration of the base triangle of r' at 5 mm from the high take-off is more than 3.5 mm in BrP 2 (SE, 81%; SP, 82%).[31]

B. Other ECG findings

1. QT generally is normal. May be prolonged in right precordial leads.[43]

2. Conduction disorders: Sometimes, prolonged PR interval (long HV interval). The conduction delay located in RV explains the r' and longer QRS duration in right precordial leads compared with mid/left precordial leads.

3. Supraventricular arrhythmias. Mostly atrial fibrillation.

4. Some other ECG findings may be seen: the presence of r' wave in aVR >3 mm,[44] early repolarization pattern in inferior leads,[45] fractioned QRS,[46] alternans of T wave after ajmaline injection,[47] etc.
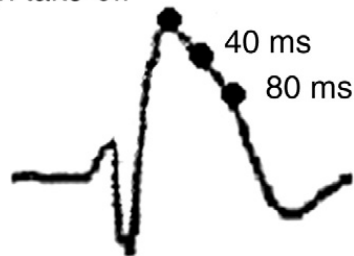
Current electrocardiographic criteria for diagnosis of Brugada pattern: a consensus report

Bayés de Luna A, **Brugada** J, Baranchuk A, Borggrefe M, Breithardt G, Goldwasser D, Lambiase P, Riera AP, Garcia-Niebla J, Pastore C, Oreto G, McKenna W, Zareba W, **Brugada** R, **Brugada** P.

ECG patterns of BrS in V1-V2

| Type 1: coved pattern	Type 2: saddle-back pattern

This typical coved pattern present in V1-V2 the following:
a. At the end of QRS, an ascending and quick slope with a high take-off ≥2mm followed by concave or rectilinear downsloping ST. There are few cases of coved pattern with a high take-off between 1 and 2 mm.
b. There is no clear r' wave.
c. The high take-off often does not correspond with the J point (Fig. 4 B).
d. At 40 ms of high take-off, the decrease in amplitude of ST is ≤4mm.[28] In RBBB and athletes, it is much higher.
e. ST at high take-off > ST at 40 ms > ST at 80 ms.
f. ST is followed by negative and symmetric T wave
g. The duration of QRS is longer than in RBBB, and there is a mismatch between V1 and V6 (see text).
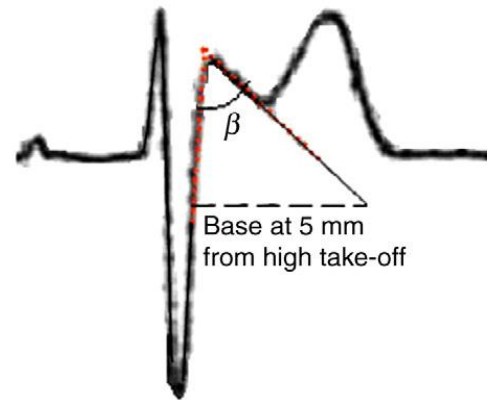
This typical saddle-back pattern present in V1-V2 the following:
a. High take-off of r' (that often does not coincide with J point) ≥2 mm.
b. Descending arm of r' coincides with beginning of ST (often is not well seen).
c. Minimum ST ascent ≥0.5 mm
d. ST is followed by positive T wave in V2 (T peak > ST minimum > 0) and of variable morphology in V1.
e. The characteristics of triangle formed by r' allow to define different criteria useful for diagnosis (see above and text).
  ● β angle.[26]
  ● Duration of the base of the triangle of r' at 5 mm from the high take-off greater than 3.5mm[31]
f. The duration of QRS is longer in BrP type 2 than in other cases with r' in V1, and there is a mismatch between V1 and V6 (see text).

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

Bayés de Luna A, **Brugada** J, Baranchuk A, Borggrefe M, Breithardt G, Goldwasser D, Lambiase P, Riera AP, Garcia-Niebla J, Pastore C, Oreto G, McKenna W, Zareba W, **Brugada** R, **Brugada** P.

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HRS/EHRA/APHRS CONSENSUS STATEMENT
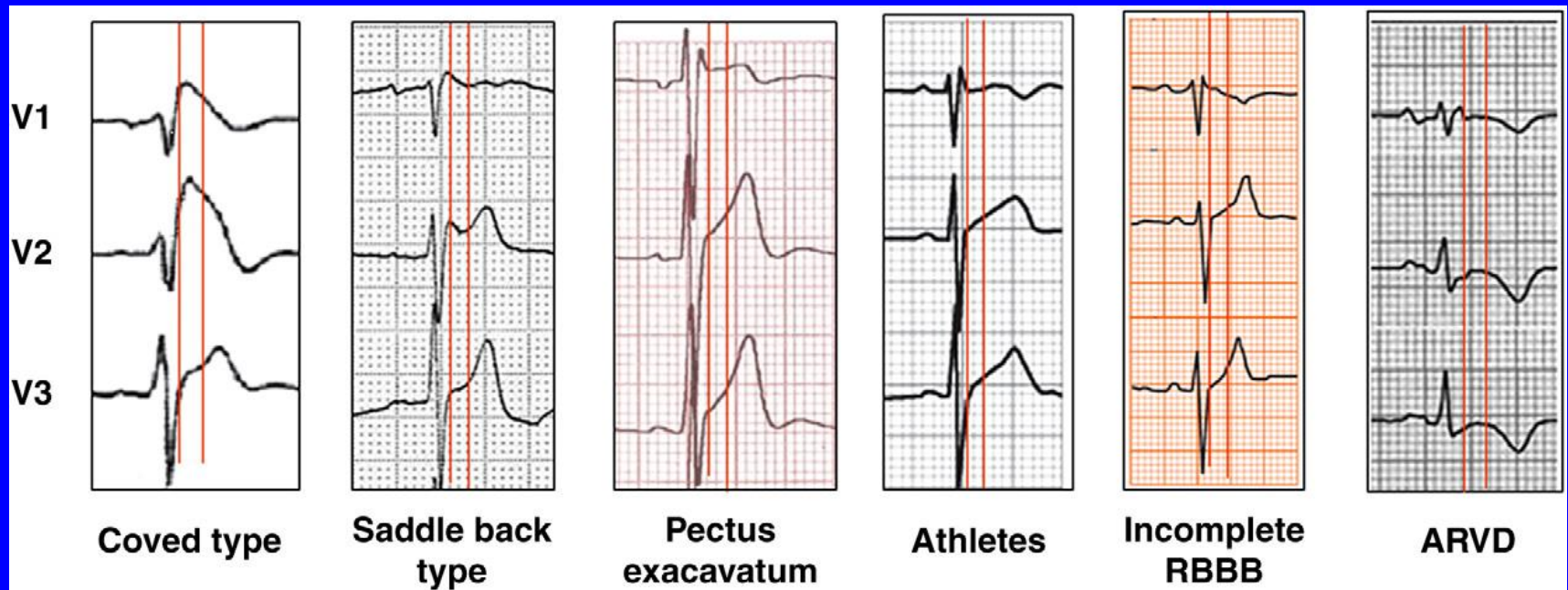
Executive summary: HRS/EHRA/APHRS expert consensus statement on the diagnosis and management of patients with inherited primary arrhythmia syndromes

Silvia G. Priori, (HRS Chairperson)[1], Arthur A. Wilde, (EHRA Chairperson)[2], Minoru Horie, (APHRS Chairperson)[3], Yongkeun Cho, (APHRS Chairperson)[4], Elijah R. Behr[5], Charles Berul[6], Nico Blom[7*], Josep Brugada[8], Chern-En Chiang[9], Heikki Huikuri[10], Prince Kannankeril[11‡], Andrew Krahn[12], Antoine Leenhardt[13], Arthur Moss[14], Peter J. Schwartz[15], Wataru Shimizu[16], Gordon Tomaselli[17†], Cynthia Tracy[‰18]

Expert Consensus Recommendations on **BrS Diagnosis**

1. BrS *is diagnosed* in patients with ST-segment elevation with **type I** morphology ≥ 2 mm in ≥ 1 lead among the right precordial leads V_1, V_2 positioned in the 2nd, 3rd, or 4th intercostal space occurring either spontaneously *or* after provocative drug test with intravenous administration of Class I antiarrhythmic drugs.

2. BrS *is diagnosed* in patients with type 2 or type 3 ST- segment elevation in ≥ 1 lead among the right precordial leads V_1, V_2 positioned in the 2nd, 3rd, or 4th intercostal space when a provocative drug test with intravenous administration of Class I antiarrhythmic drugs induces a **type I** ECG morphology.

*Expert Consensus Recommendations on **BrS Therapeutic Interventions***

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Class I

1. The following lifestyle changes **are recommended** in all patients with diagnosis of BrS:

    a. Avoidance of drugs that may induce or aggravate ST-segment elevation in right precordial leads (e.g., Brugadadrugs.org)

    b. Avoidance of excessive alcohol intake

    c. Immediate treatment of fever with antipyretic drugs.

2. ICD implantation **is recommended** in patients with a diagnosis of BrS who:

    a. Are survivors of a cardiac arrest *and/or*

    b. Have documented spontaneous sustained VT with or without syncope.

Class IIa	3. ICD implantation **can be useful** in patients with a spontaneous diagnostic type I ECG who have a history of syncope judged to be likely caused by ventricular arrhythmias.
	4. Quinidine **can be useful** in patients with a diagnosis of BrS and history of arrhythmic storms defined as more than two episodes of VT/VF in 24 hours.
	5. Quinidine **can be useful** in patients with a diagnosis of BrS who:
	a. Qualify for an ICD but present a contraindication to the ICD or refuse it *and/or*
	b. Have a history of documented supraventricular arrhythmias that require treatment.
	6. Isoproterenol infusion **can be useful** in suppressing arrhythmic storms in BrS patients.

Class IIb	7. ICD implantation **_may be considered_** in patients with a diagnosis of BrS who develop VF during programmed electrical stimulation (inducible patients).
	8. Quinidine **_may be considered_** in asymptomatic patients with a diagnosis of BrS with a spontaneous **type I** ECG.
	9. Catheter ablation **_may be considered_** in patients with a diagnosis of BrS and history of arrhythmic storms or repeated appropriate ICD shocks.
Class III	10. ICD implantation **_is not indicated_** in asymptomatic BrS patients with a drug-induced **type I** ECG and on the basis of a family history of sudden cardiac death (SCD) alone.

Consensus recommendations for ICDs in patients diagnosed with Brugada syndrome
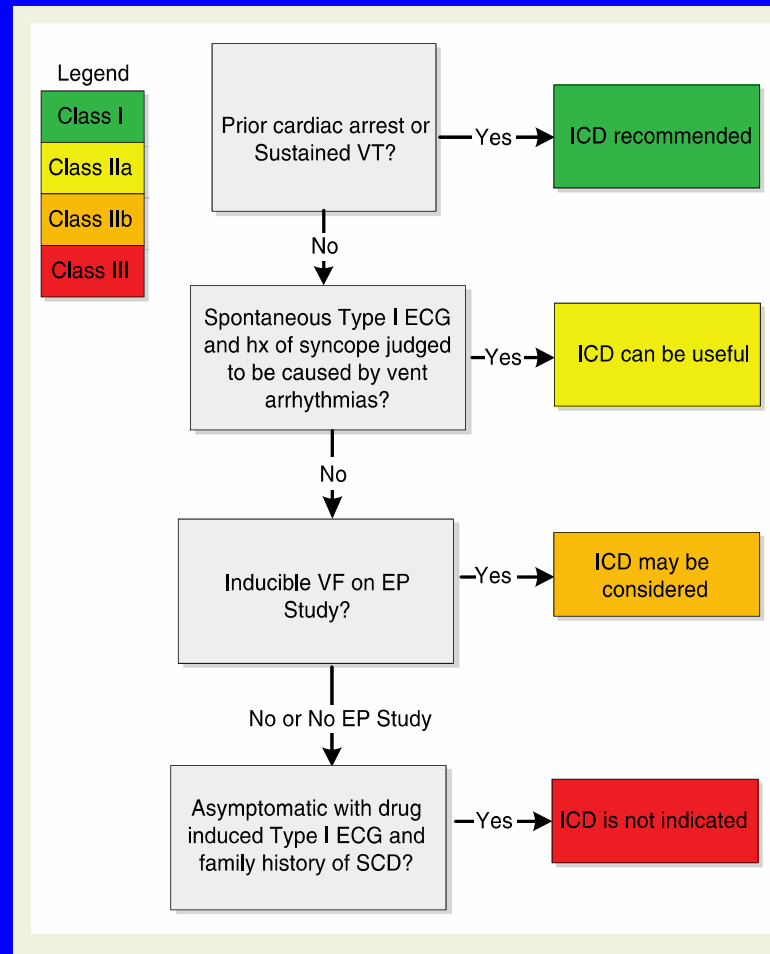
σ. Brugada : Συνδυασμός «ηλεκτρικής» και δομικής καρδιοπάθειας ;

- Ήπια συστολική δυσλειτουργία της ΔΚ (MRI)

- Ιστολογικές ενδείξεις ίνωσης του χώρου εξόδου της ΔΚ

- Ηλεκτροανατομικά χαρακτηριστικά του επικαρδίου του χώρου εξόδου της ΔΚ

ΕΥΧΑΡΙΣΤΩ