

UNFCV : les « syndromes électriques du cœur »

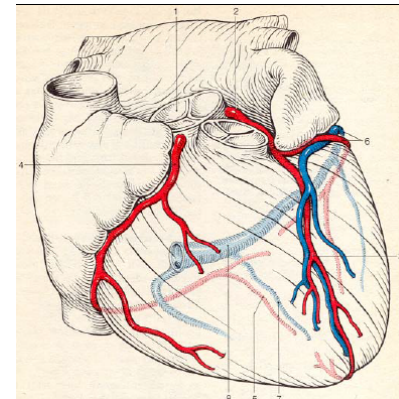
Nice, le 11 Avril 2015



JC Deharo, Marseille

Mort subite

- Définition: décès brutal inattendu sans symptômes au préalable
- Epidémiologie : 40 000 cas / an en France
- Physiopathologie: Trouble du rythme ventriculaire grave responsable d'un arrêt cardio circulatoire.
- Etiologies : **Après 45 ans : Coronaropathie**



**Avant 45 ans : Troubles du rythme d'origine
génétique**
(10-30%)

Pathologies rythmiques héréditaires

= risque de mort subite

Cœur Sain

- Syndrome du QT long congénital
- Syndrome de Brugada
- TV catécholergiques
- Syndrome de repolarisation précoce
- Syndrome du QT court

Cœur pathologique

- Cardiomyopathie hypertrophique
- Dysplasie arythmogène du ventricule droit (DVDA)

HRS/EHRA/APHRS Expert Consensus Statement on the Diagnosis and Management of Patients with Inherited Primary Arrhythmia Syndromes

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Europace 2013

HRS/EHRA Expert Consensus Statement on the State of Genetic Testing for the Channelopathies and Cardiomyopathies

This document was developed as a partnership between the Heart Rhythm Society (HRS) and the European Heart Rhythm Association (EHRA)

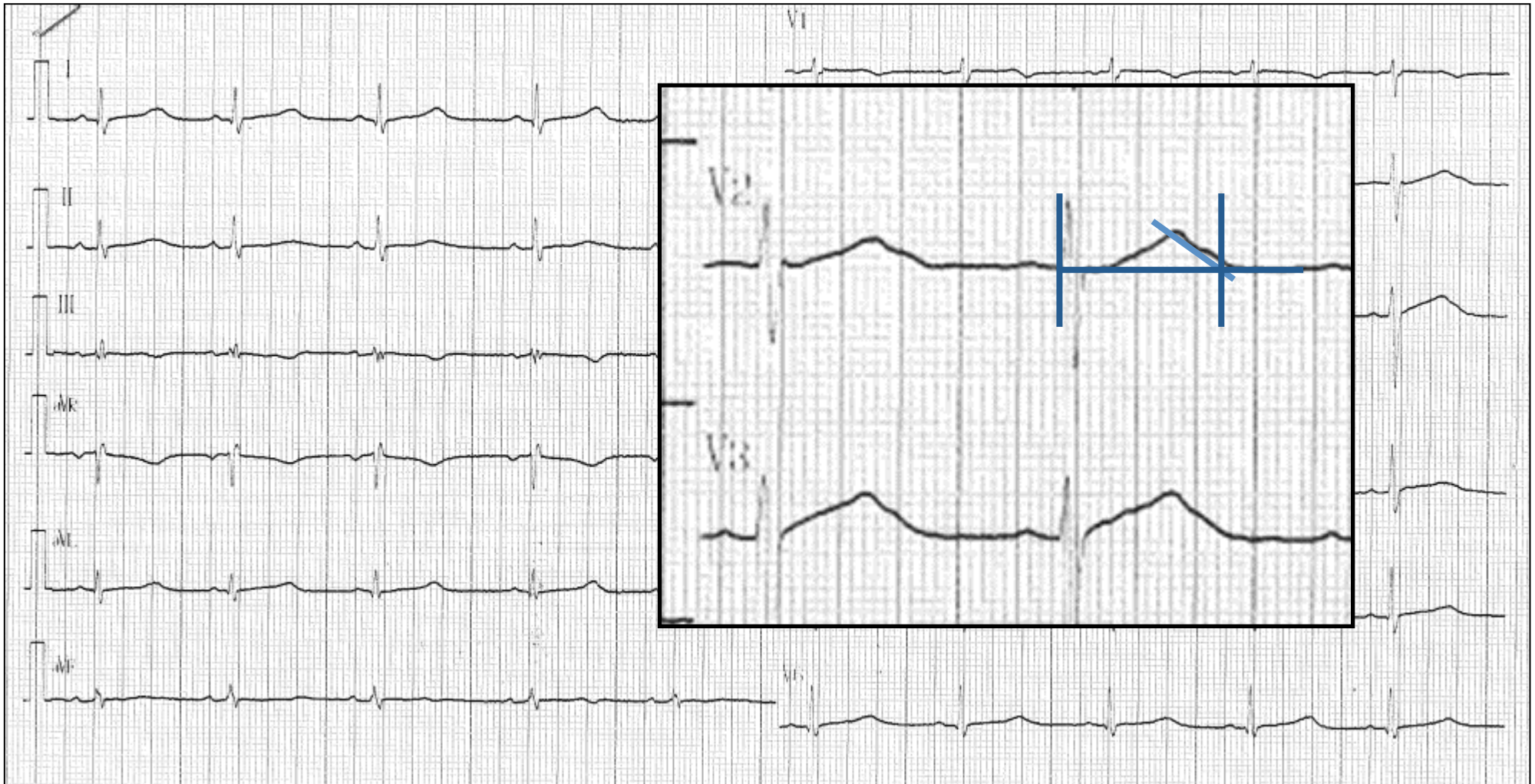
Michael J. Ackerman, MD, PhD,¹ Silvia G. Priori, MD, PhD,² Stephan Willems, MD, PhD,³ Charles Berul, MD, FHRS, CCDS,⁴ Ramon Brugada, MD, PhD,⁵ Hugh Calkins, MD, FHRS, CCDS,⁶ A. John Camm, MD, FHRS,⁷ Patrick T. Ellinor, MD, PhD,⁸ Michael Gollob, MD,⁹ Robert Hamilton, MD, CCDS,¹⁰ Ray E. Hershberger, MD,¹¹ Daniel P. Judge, MD,^{6,12} Hervé Le Marec, MD,¹³ William J. McKenna, MD,¹⁴ Eric Schulze-Bahr, MD, PhD,¹⁵ Chris Semsarian, MBBS, PhD,¹⁶ Jeffrey A. Towbin, MD,¹⁷ Hugh Watkins, MD, PhD,¹⁸ Arthur Wilde, MD, PhD,¹⁹ Christian Wolpert, MD,²⁰ Douglas P. Zipes, MD, FHRS²¹

Europace 2011

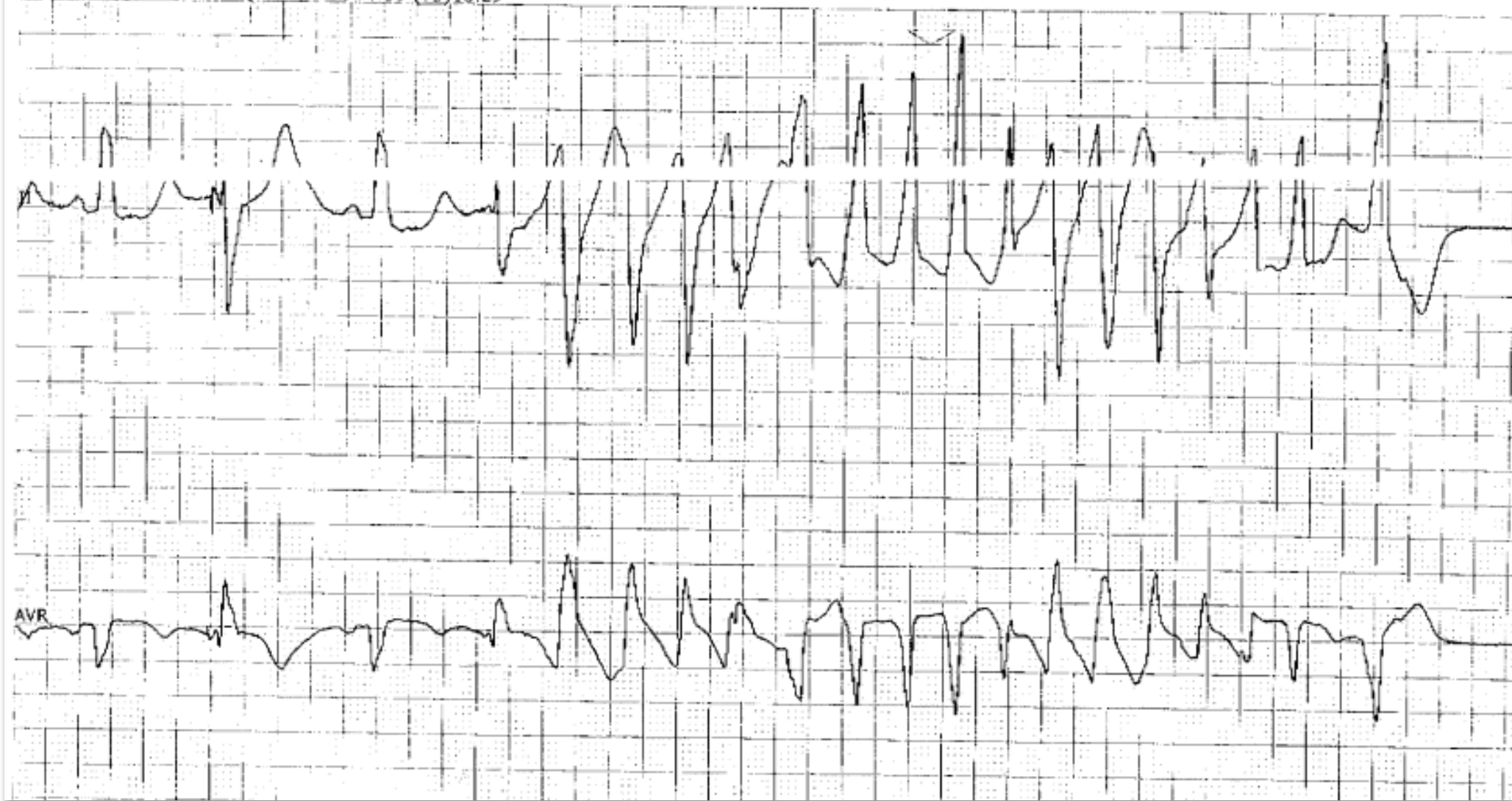
Observation 1

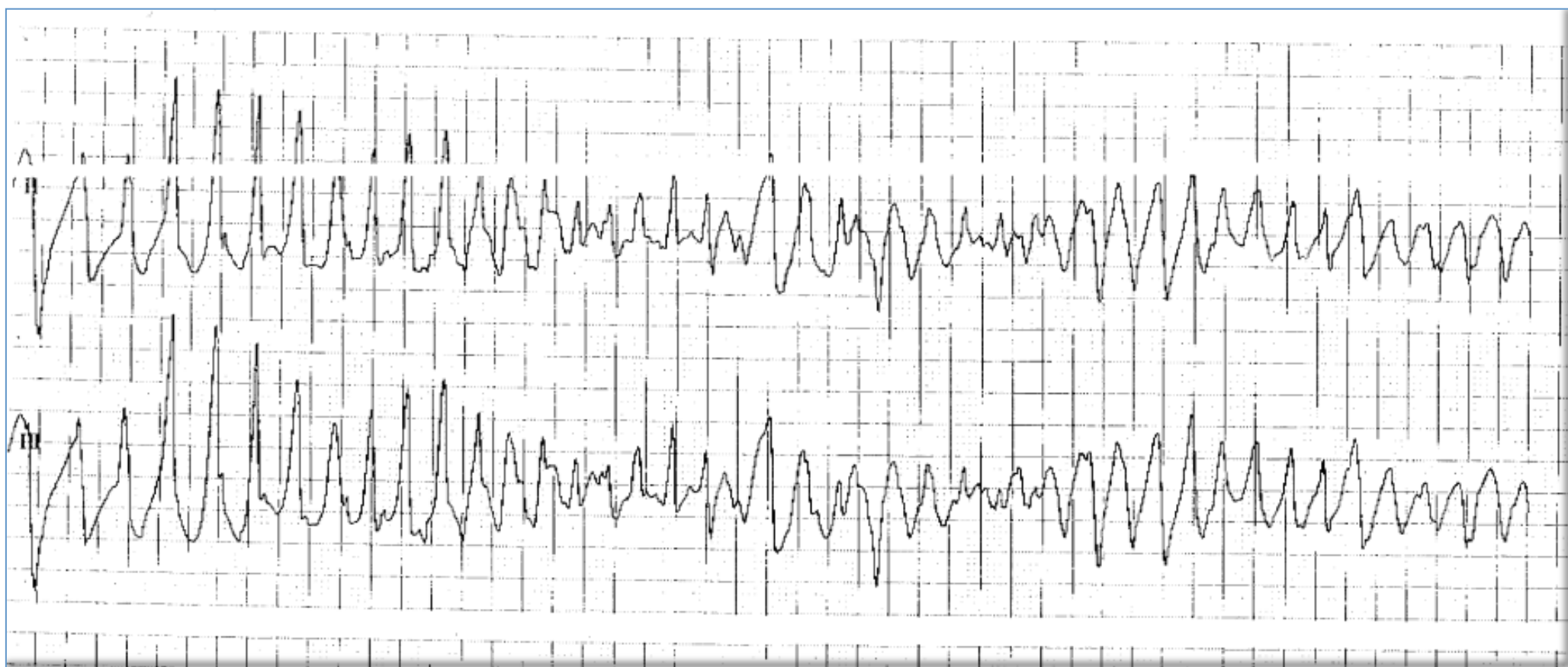
- Mme D... 57 ans
- Palpitations anciennes évoquant des ES
- Syncope à l'âge de 24 ans (→ poussée hypertensive?)
- Récidive en 2000 avec traumatisme facial
- Vers 09:00, syncope → appel SAMU → multiples épisodes syncopaux
- Admise en service de cardiologie

QT = 560 ms / QTc = 560 ms



0FO2 100% FREQ 75 PNL9/7/59 (73)16:29





- Conduite à tenir
 - Diagnostique
 - Thérapeutique

- Conduite à tenir
 - Diagnostique : QT long certain
 - Thérapeutique :
 - bêta-bloquants +++
 - Règles à respecter
 - Discussion DAI

DIAGNOSTIC

2. Long QT Syndrome (LQTS)

Expert Consensus Recommendations on LQTS Diagnosis

1. LQTS is diagnosed:
 - a. In the presence of an LQTS risk score ≥ 3.5 in the absence of a secondary cause for QT prolongation *and/or*
 - b. In the presence of an unequivocally pathogenic mutation in one of the LQTS genes *or*
 - c. In the presence of a QT interval corrected for heart rate using Bazett's formula (QTc) ≥ 500 ms in repeated 12-lead electrocardiogram (ECG) and in the absence of a secondary cause for QT prolongation.
2. LQTS can be diagnosed in the presence of a QTc between $480\text{--}499$ ms in repeated 12-lead ECGs in a patient with unexplained syncope in the absence of a secondary cause for QT prolongation and in the absence of a pathogenic mutation.

Score de probabilité

≥ 3.5 : Forte

= 1.5-3 : Intermédiaire

≤ 1 : Faible

Table 2. 1993–2011 LQTS Diagnostic Criteria

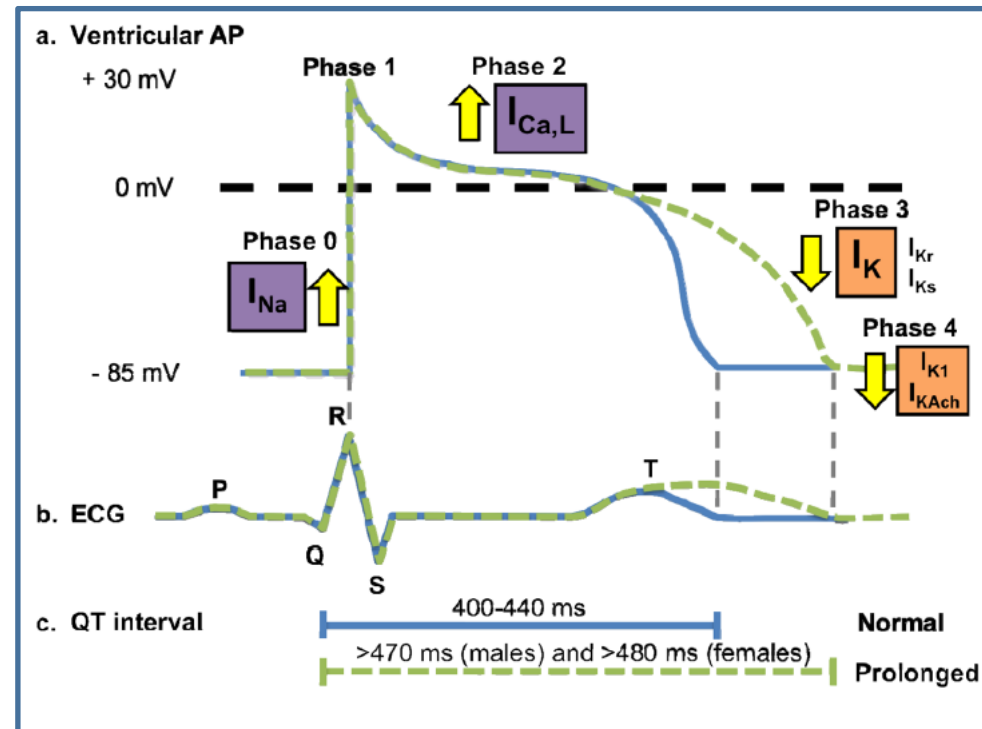
	Points
Electrocardiographic findings #	
A QTc ⁺	
≥480 ms	3
460–479 ms	2
450–459 ms (in males)	1
B QTc ⁺ 4 th minute of recovery from exercise stress test ≥480 ms	1
C Torsade de pointes*	2
D T wave alternans	1
E Notched T wave in 3 leads	1
F Low heart rate for age@	0.5
Clinical history	
A Syncope*	
With stress	2
Without stress	1
B Congenital deafness	0.5
Family history	
A Family members with definite LQTS\$	1
B Unexplained sudden cardiac death below age 30 among immediate family members\$	0.5

Syndrome du QT Long congénital

Prévalence

1/2000

Physiopathologie



Syndrome du QT Long congénital

Génétique

Mode de transmission

- autosomique dominant 90-95%
- de novo 5-10%

Pénétrance incomplète

15 gènes/600 mutations

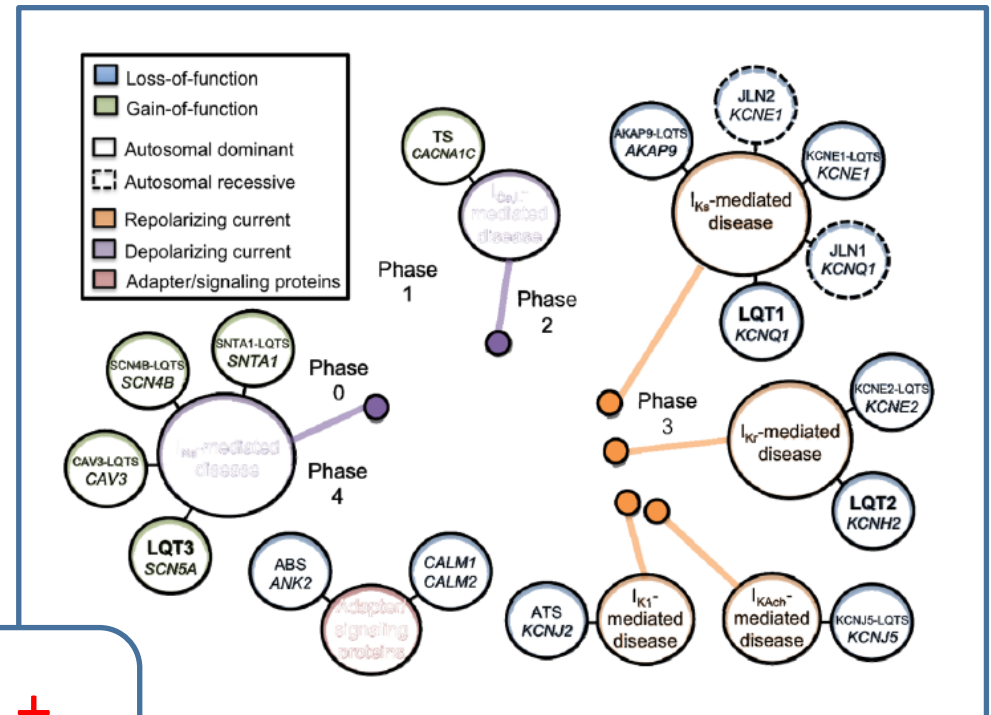
3 principaux gènes (75%):

KCNH1 (35%) I_{ks}

KCNQ2 (30%) I_{Kr}

SCN5A (10%) I_{Na}

Mutation +
50 % des cas



GENE	LOCUS	PROTEIN
Long QT Syndrome		
Major LQTS Genes		
<i>KCNQ1 (LQT1)</i>	11p15.5	I _{Ks} potassium channel α subunit (K _v LQT1, K _v 7.1)
<i>KCNH2 (LQT2)</i>	7q35-36	I _{Kr} potassium channel α subunit (HERG, K _v 11.1)
<i>SCN5A (LQT3)</i>	3p21-p24	Cardiac sodium channel α subunit (Na _v 1.5)
Minor LQTS Genes (listed alphabetically)		
<i>AKAP9</i>	7q21-q22	Yotiao
<i>CACNA1C</i>	12p13.3	Voltage gated L-type calcium channel (Ca _v 1.2)
<i>CALM1</i>	14q32.11	Calmodulin
<i>CALM2</i>	2p21	Calmodulin
<i>CAV3</i>	3p25	Caveolin-3
<i>KCNE1</i>	21q22.1	K _v 7.1 potassium channel beta subunit (MinK)
<i>KCNE2</i>	21q22.1	K _v 11.1 potassium channel beta subunit (MiRP1)
<i>KCNJ5</i>	11q24.3	Potassium inwardly-rectifying channel (Kir3.4)
<i>SCN4B</i>	11q23.3	Sodium channel beta 4 subunit
<i>SNTA1</i>	20q11.2	Syntrophin-alpha 1
Ankyrin-B Syndrome		
<i>ANK2</i>	4q25-q27	Ankyrin B
Andersen-Tawil Syndrome		
<i>KCNJ2 (ATS1)</i>	17q23	I _{K1} potassium channel (Kir2.1)
Timothy Syndrome		
<i>CACNA1C</i>	12p13.3	Voltage gated L-type calcium channel (Ca _v 1.2)

Syndrome du QT Long congénital

Diagnostic

- ❖ $QTC \geq 500$ ms sans symptômes
- ❖ $QTC \geq 480$ ms avec syncope
- ❖ Mutation présente

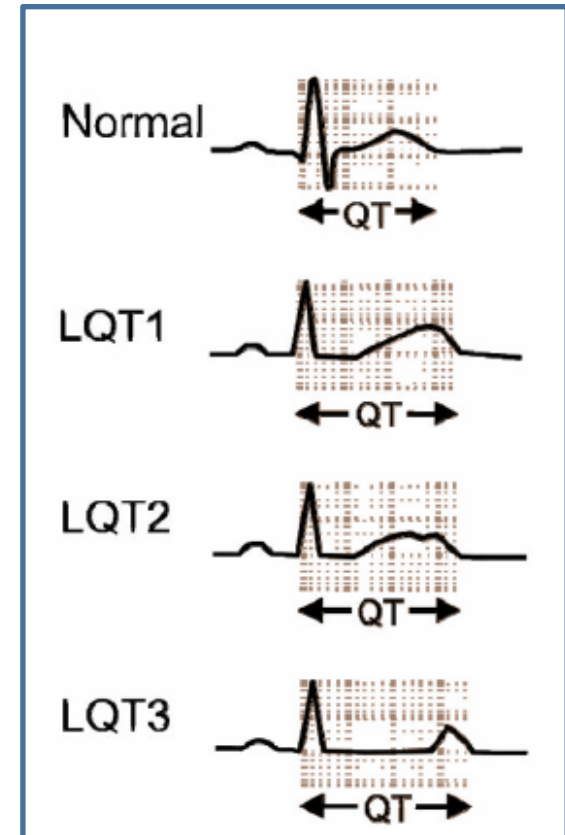
ECG ++

Clinique

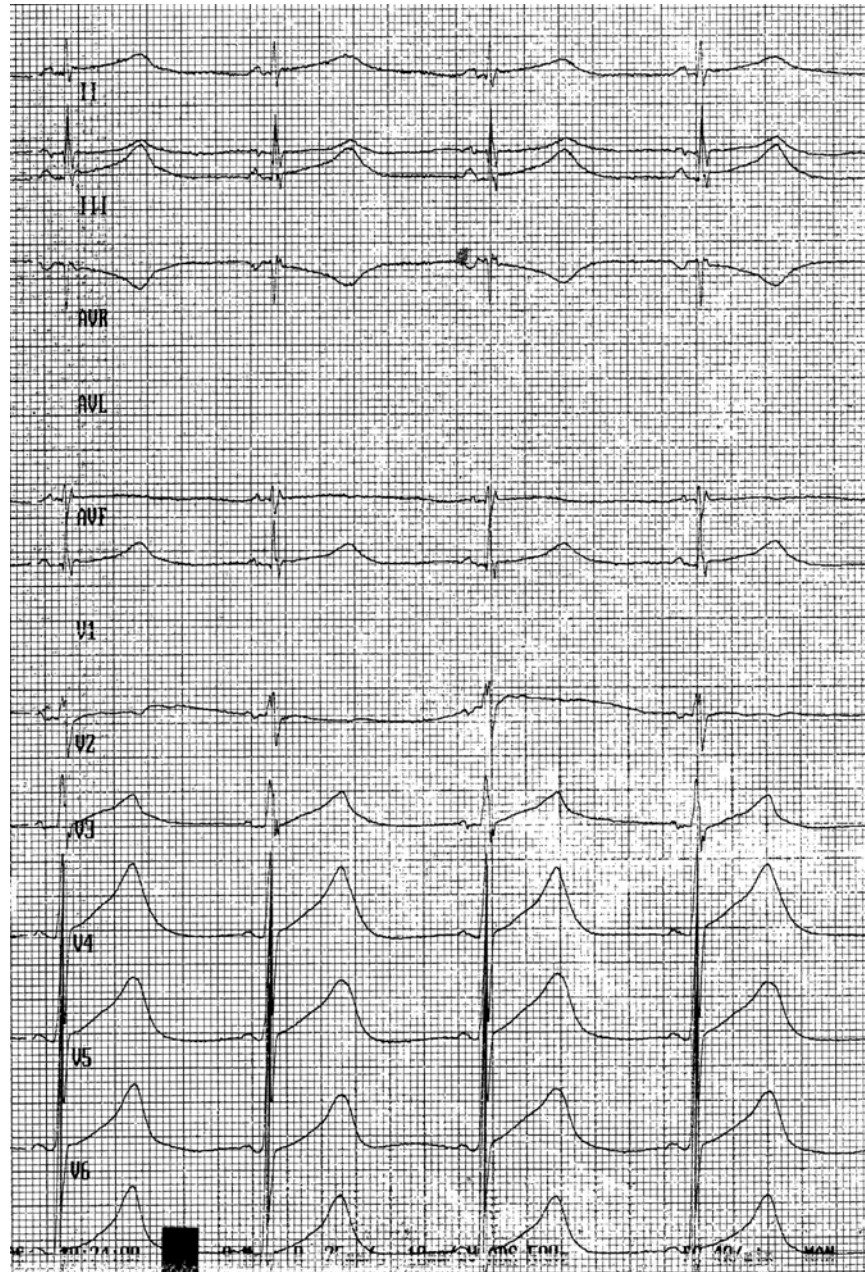
Syncope précédée ou non de palpitations

Circonstances adrénergiques +++

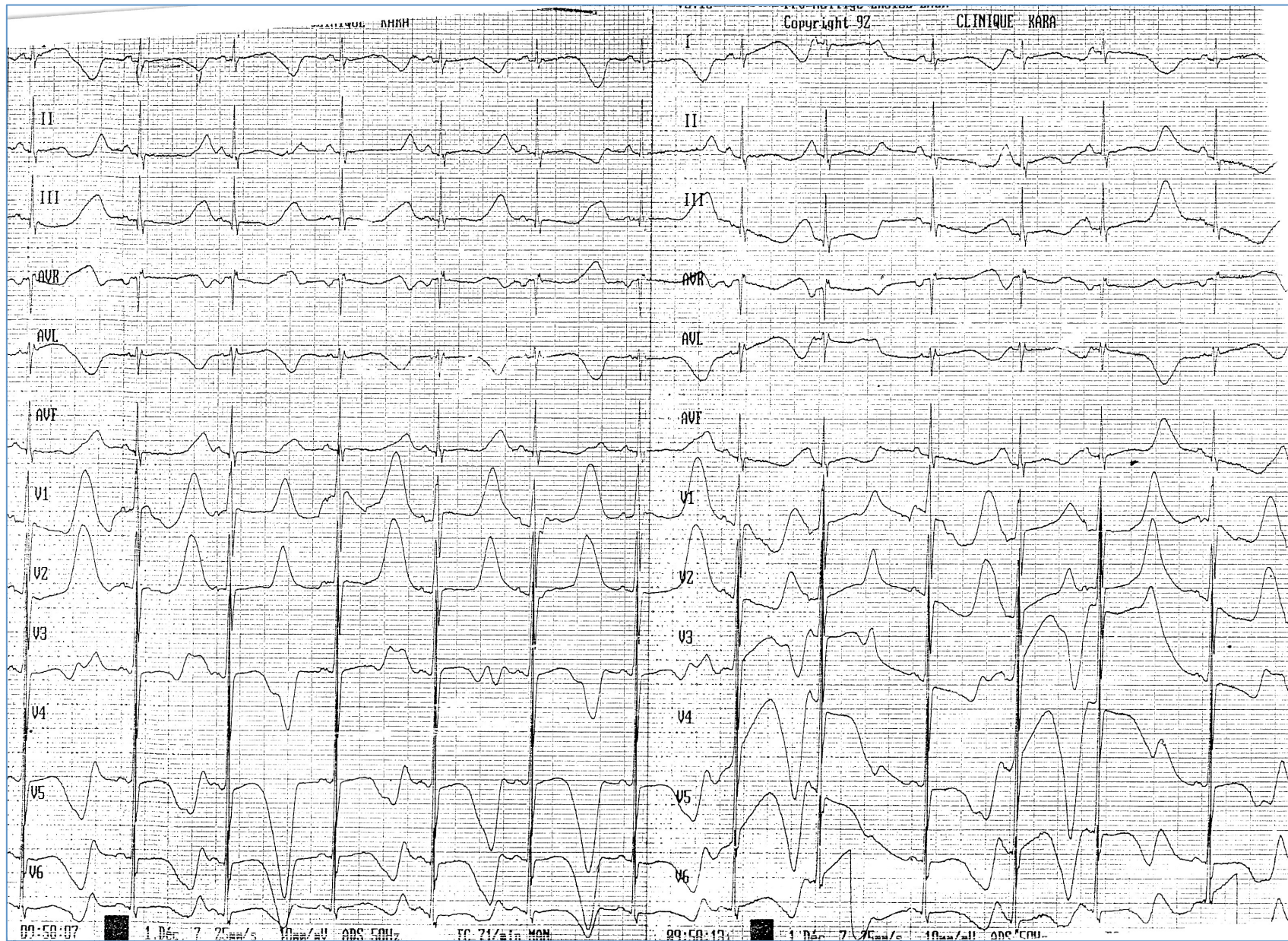
Mort subite



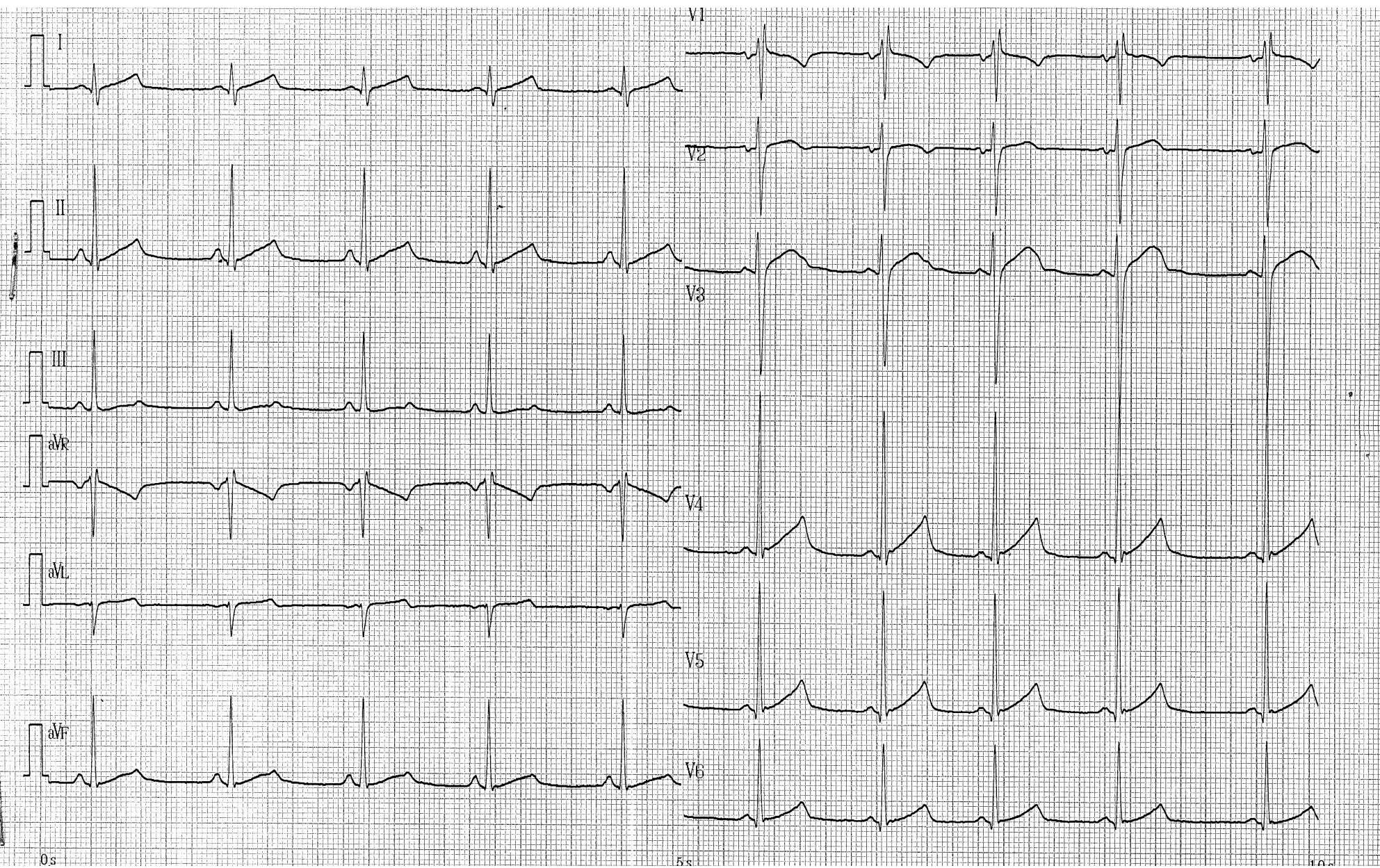
Syndrome du QT Long congénital



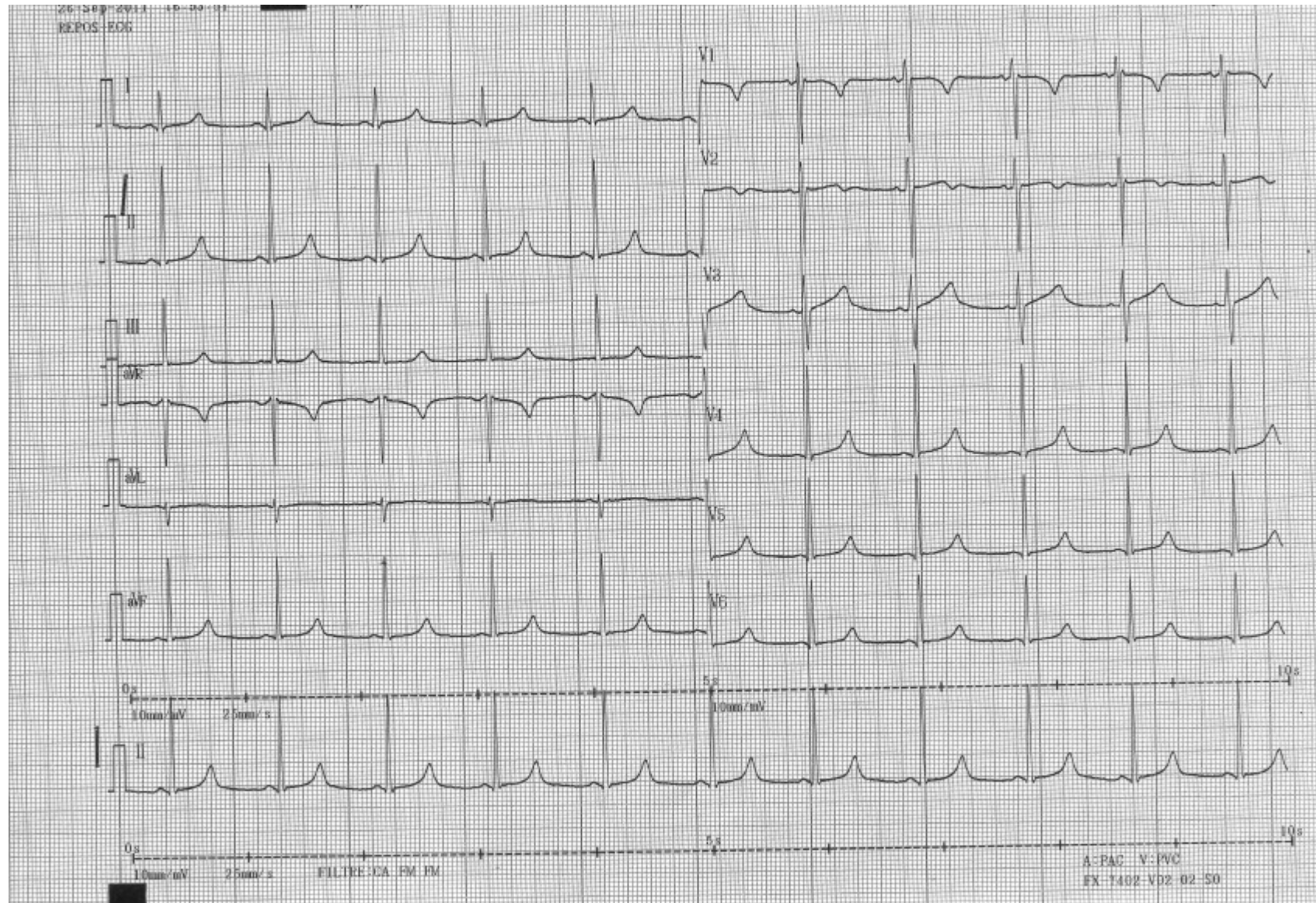
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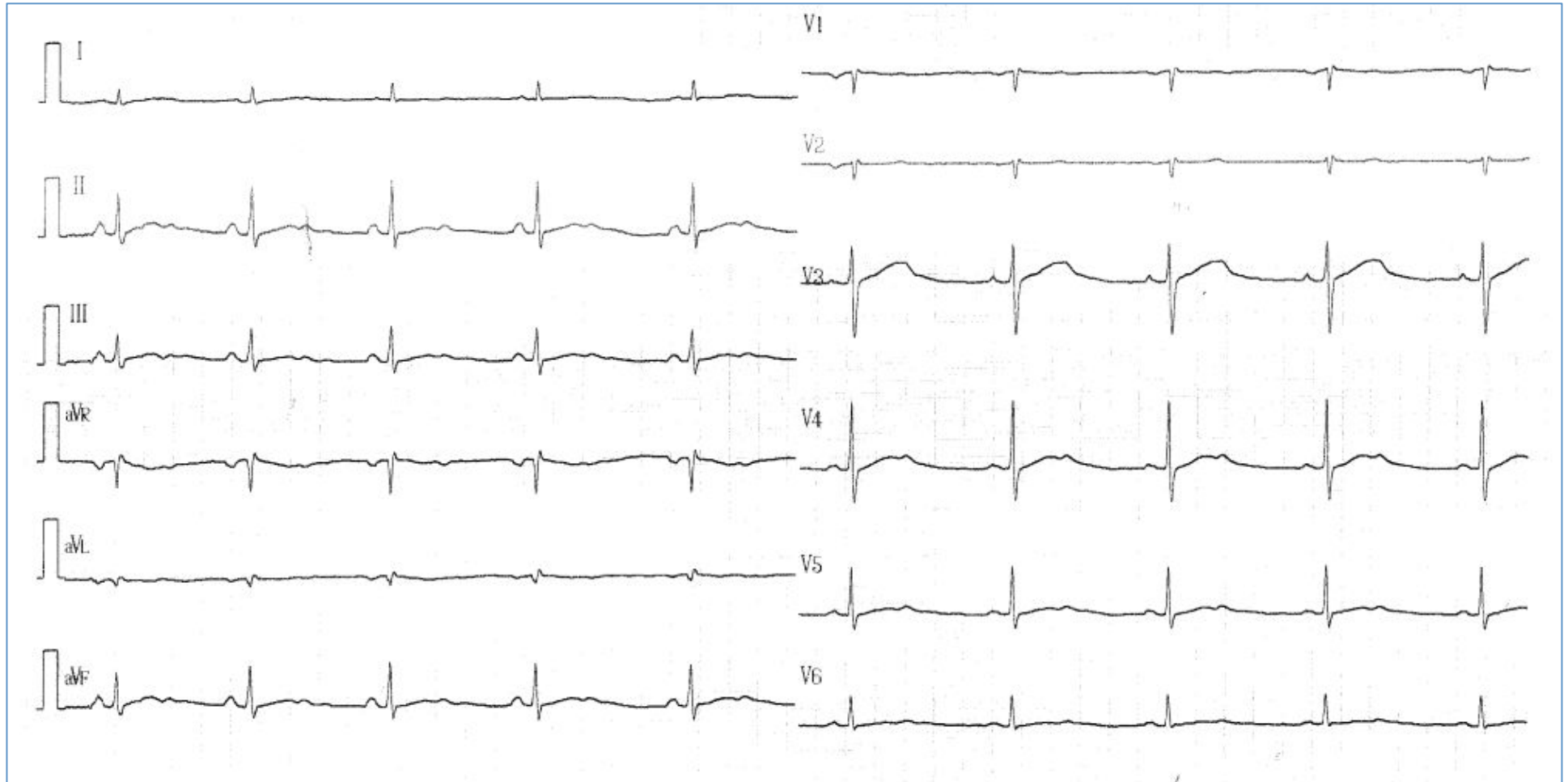
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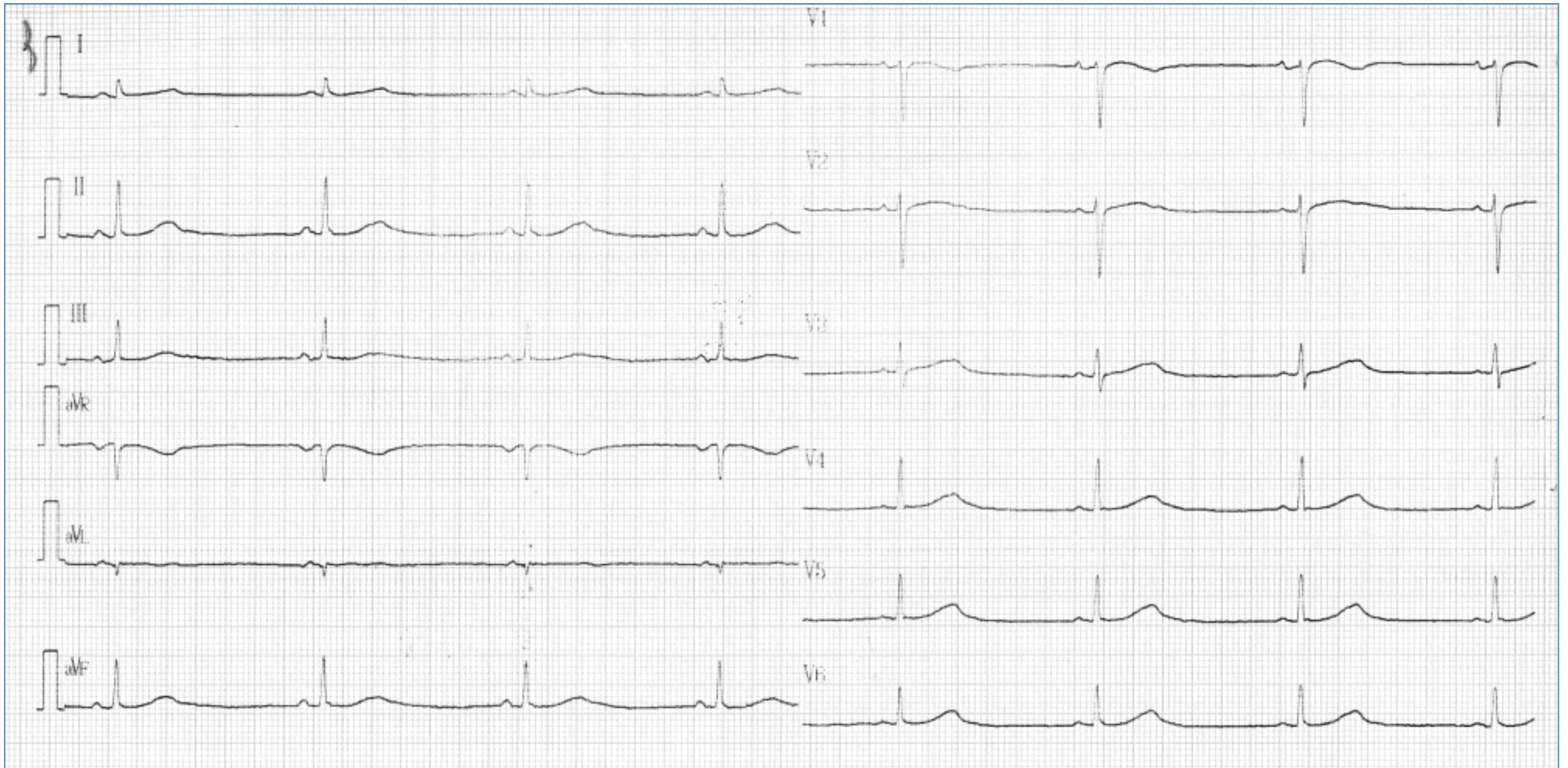
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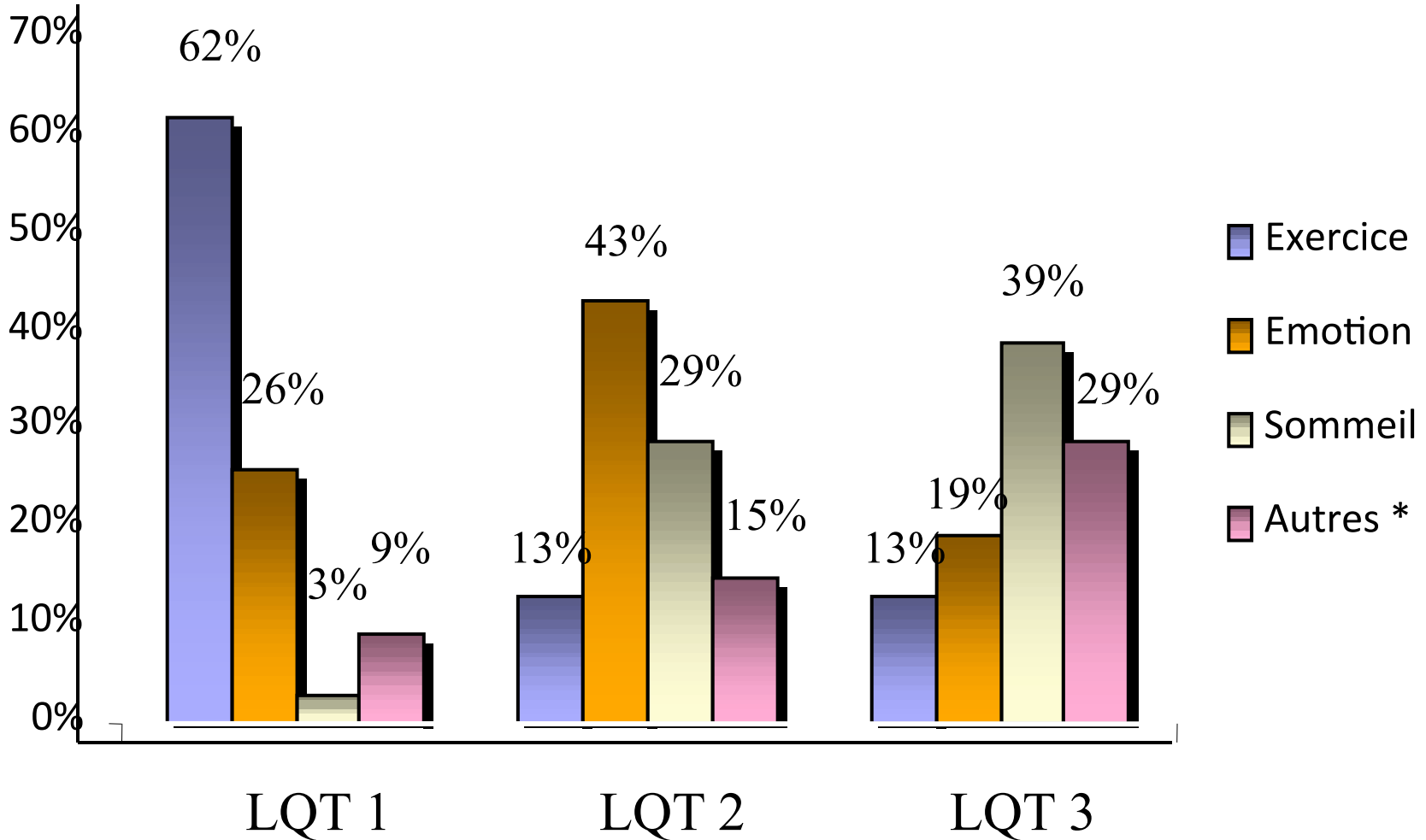
Syndrome du QT Long congénital



Syndrome du QT Long congénital



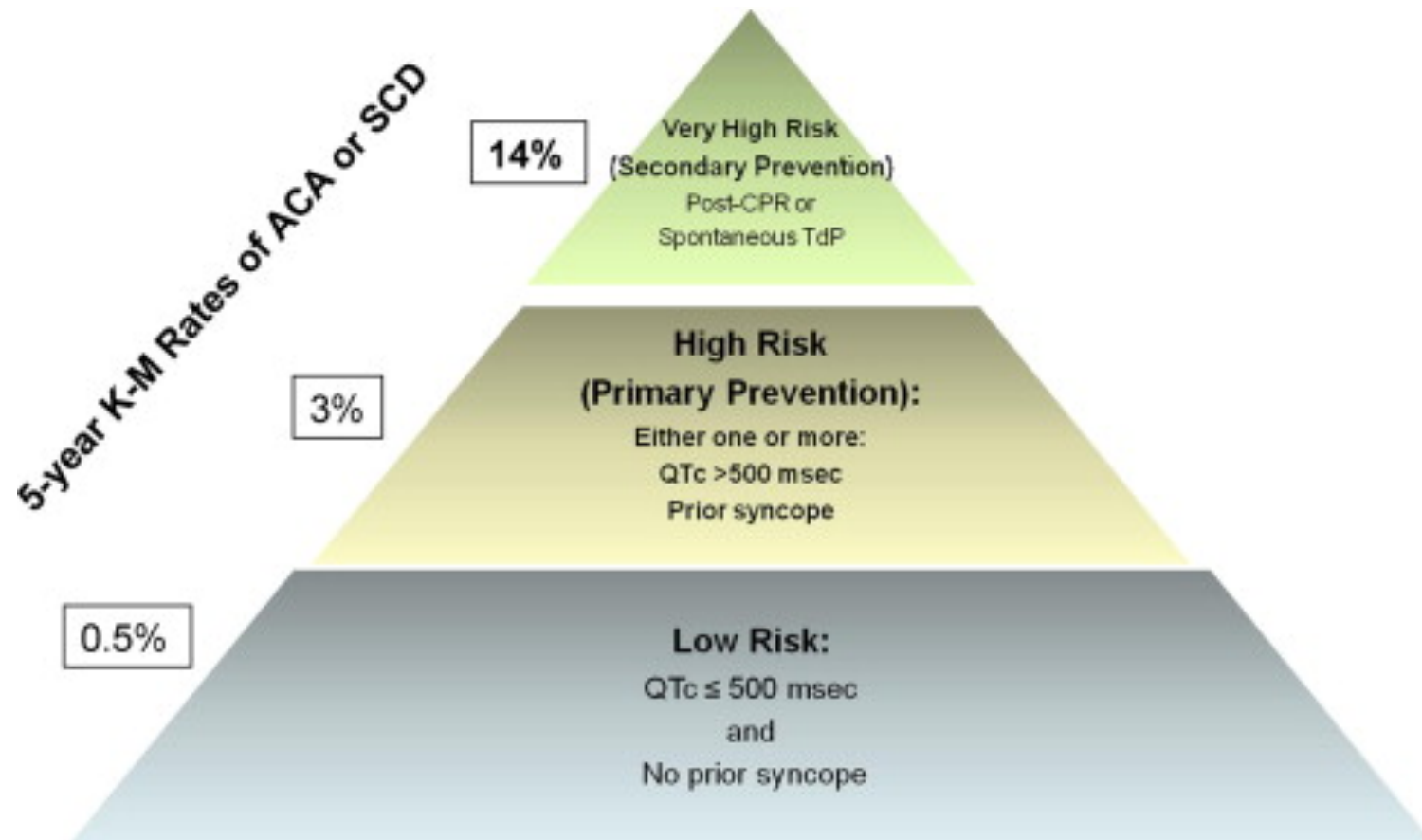
Syncope /Mort subite selon le génotype



Autres : anesthésie, fièvre, règles, grossesse

Syndrome du QT Long congénital

Pronostic



Risk for Life-Threatening Cardiac Events in Patients With Genotype-Confirmed Long-QT Syndrome and Normal-Range Corrected QT Intervals

Ilan Goldenberg, MD*, Samuel Horr, MA*, Arthur J. Moss, MD*, Coeli M. Lopes, PhD†, Alon Barsheshet, MD*, Scott McNitt, MS*, Wojciech Zareba, MD, PhD*, Mark L. Andrews, BBA*, Jennifer L. Robinson, MS*, Emanuela H. Locati, MD§, Michael J. Ackerman, MD, PhD¶, Jesaia Benhorin, MD||, Elizabeth S. Kaufman, MD#, Carlo Napolitano, MD**,††, Pyotr G. Platonov, MD, PhD§§, Silvia G. Priori, MD, PhD**,††, Ming Qi, MD‡, Peter J. Schwartz, MD‡‡, Wataru Shimizu, MD, PhD|||, Jeffrey A. Towbin, MD¶¶, G. Michael Vincent, MD***, Arthur A. M. Wilde, MD, PhD###, and Li Zhang, MD***

J Am Coll Cardiol. 2011 January 4; 57(1): 51–59. doi:10.1016/j.jacc.2010.07.038.

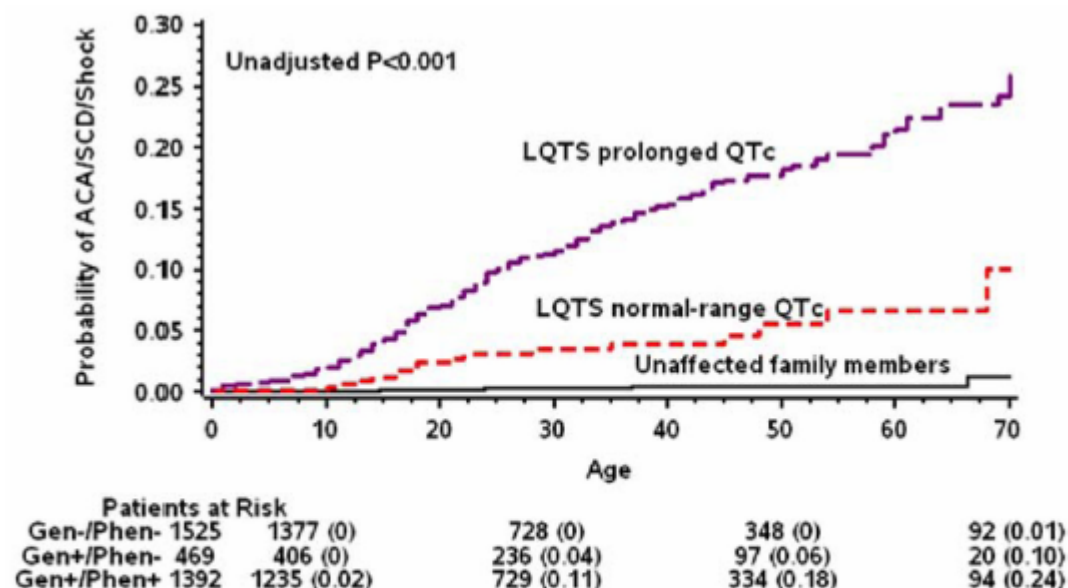
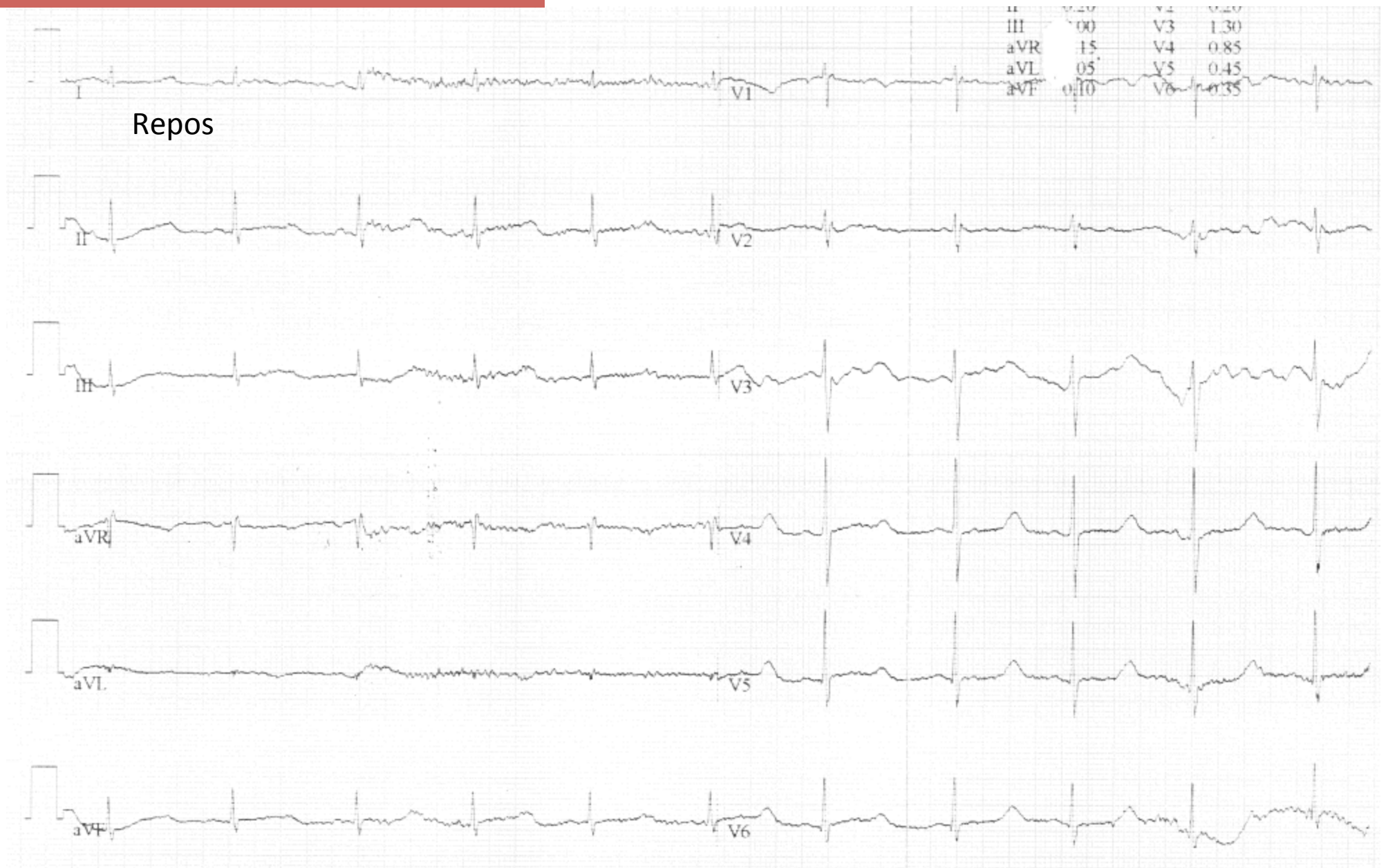
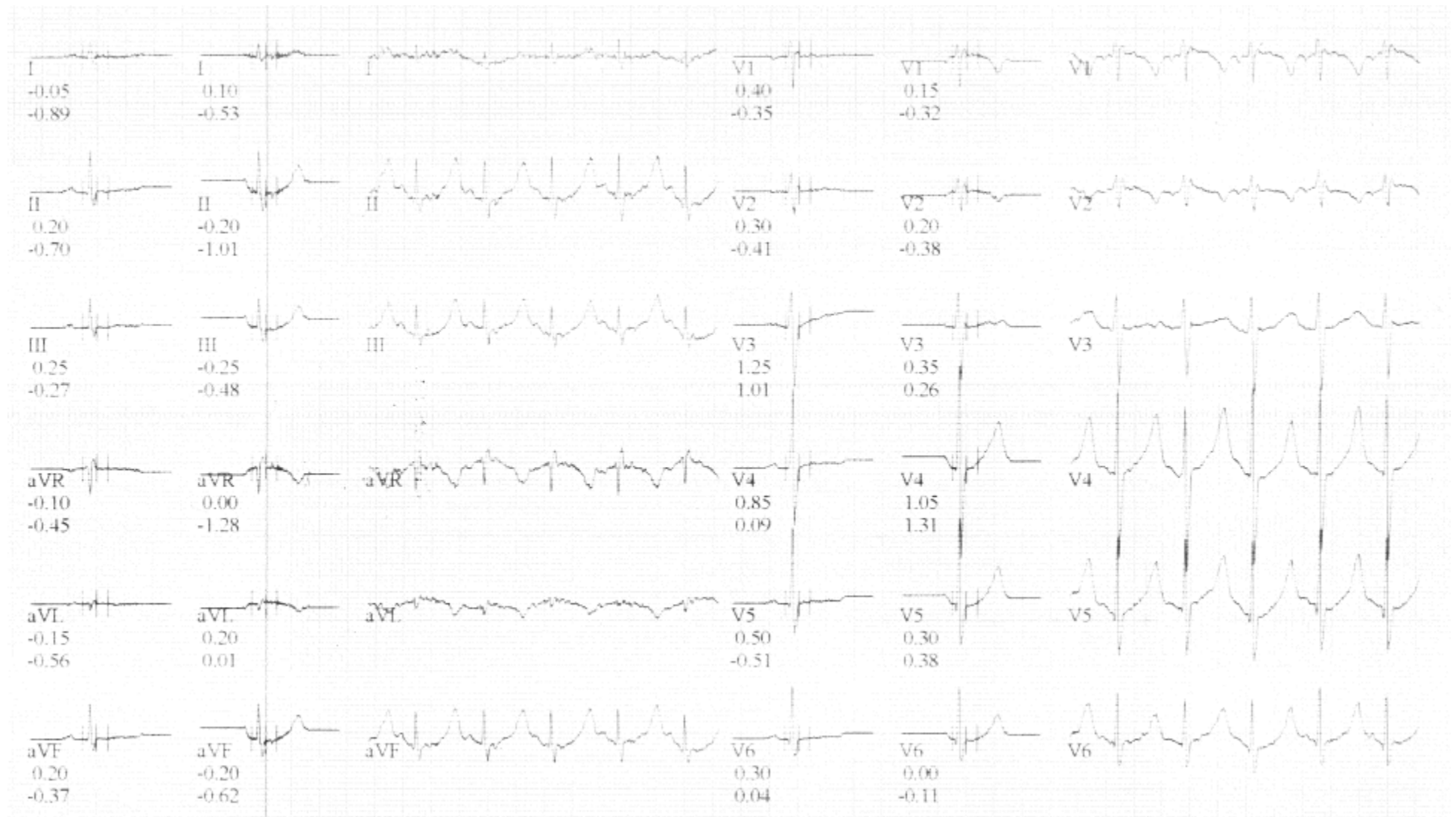


Figure 2. Rate of ACA or SCD by Genotype and QTc Category
Kaplan-Meier cumulative probabilities of aborted cardiac arrest (ACA) and sudden cardiac death (SCD) by genotype and corrected QT (QTc) subgroup. LQTS = long-QT syndrome.

Epreuve d'effort sous bêta bloquants



14 minutes



Fin effort

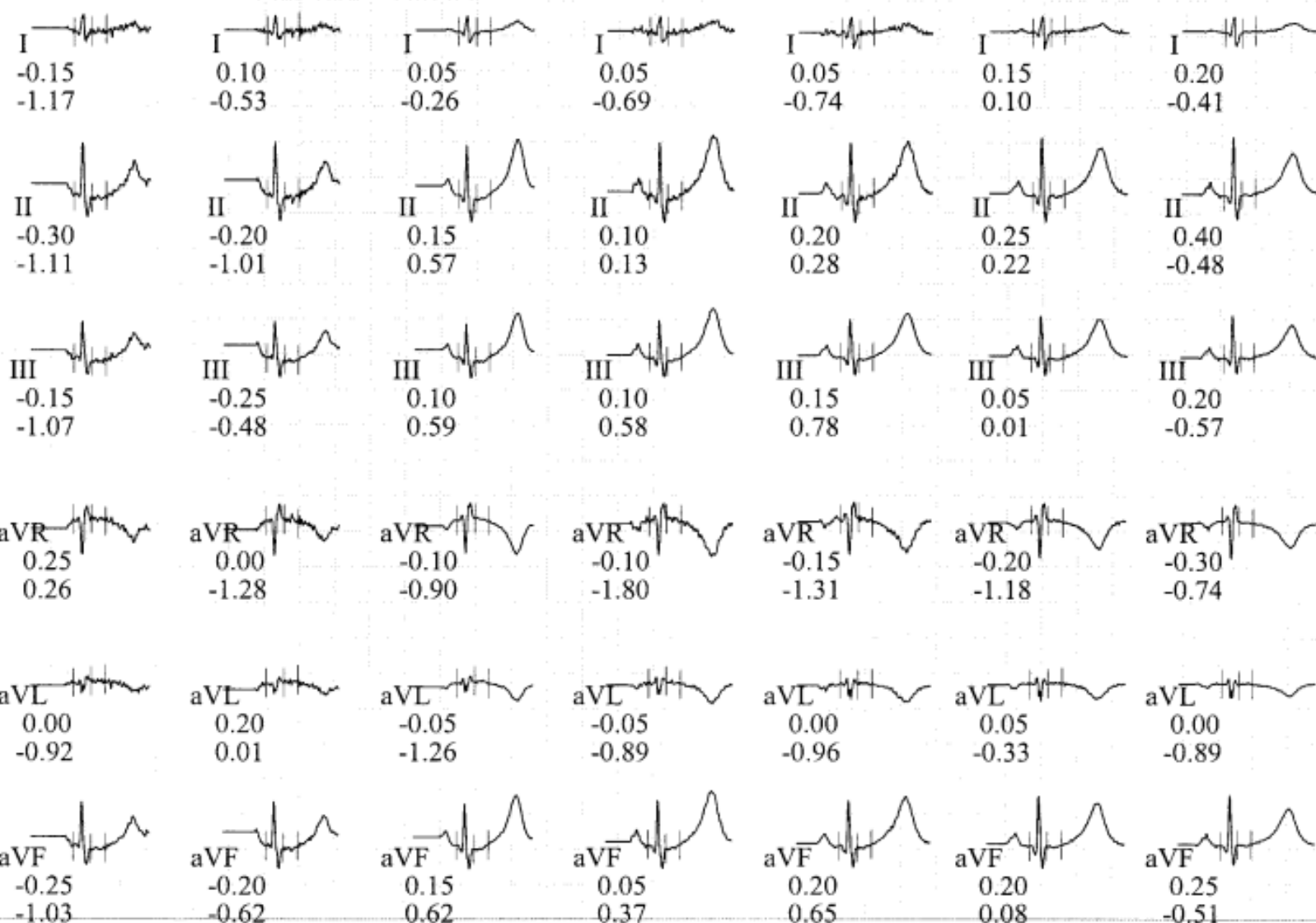
II	-0.55	V2	0.25
III	-0.25	V3	0.35
aVR	0.25	V4	1.05
aVL	0.10	V5	0.15
aVF	-0.25	V6	0.00



20W/20W/2mn

ST @ 10mm/mV

80ms après J



Dérivation

ST(mm)

Pente (mV/s)

CE CASE V6.51 (0)

Nouveau

HRS/EHRA/APHRs 2013

Class I

1. The following lifestyle changes are recommended in all patients with a diagnosis of LQTS:
 - a) Avoidance of QT-prolonging drugs (www.qtdrugs.org)
 - b) Identification and correction of electrolyte abnormalities that may occur during diarrhea, vomiting, metabolic conditions or imbalanced diets for weight loss.
2. Beta-blockers are recommended for patients with a diagnosis of LQTS who are:
 - a) Asymptomatic with QTc ≥ 470 ms *and/or*
 - b) Symptomatic for syncope or documented ventricular tachycardia/ventricular fibrillation (VT/VF).
3. Left cardiac sympathetic denervation (LCSD) is recommended for high-risk patients with a diagnosis of LQTS in whom:
 - a) Implantable cardioverter defibrillator (ICD) therapy is contraindicated or refused *and/or*
 - b) Beta-blockers are either not effective in preventing syncope/arrhythmias, not tolerated, not accepted or contraindicated.
4. ICD implantation is recommended for patients with a diagnosis of LQTS who are survivors of a cardiac arrest.
5. All LQTS patients who wish to engage in competitive sports should be referred to a clinical expert for evaluation of risk.

ACC/AHA/ESC 2006

Class I

1. Lifestyle modification is recommended for patients with an LQTS diagnosis (clinical and/or molecular). (*Level of Evidence: B*)
2. Beta blockers are recommended for patients with an LQTS clinical diagnosis (i.e., in the presence of prolonged QT interval). (*Level of Evidence: B*)
3. Implantation of an ICD along with use of beta blockers is recommended for LQTS patients with previous cardiac arrest and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: A*)

HRS/EHRA/APHRS 2013

Class I

1. The following lifestyle changes are recommended in all patients with a diagnosis of LQTS:
 - a) Avoidance of QT-prolonging drugs (www.qtdrugs.org)
 - b) Identification and correction of electrolyte abnormalities that may occur during diarrhea, vomiting, metabolic conditions or imbalanced diets for weight loss.
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 - a) Asymptomatic with $QTc \geq 470$ ms *and/or*
 - b) Symptomatic for syncope or documented ventricular tachycardia/ventricular fibrillation (VT/VF).
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3. Implantation of an ICD along with use of beta blockers is recommended for LQTS patients with previous cardiac arrest and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: A*)

HRS/EHRA/APHS 2013

Class IIa

6. Beta-blockers can be useful in patients with a diagnosis of LQTS who are asymptomatic with QTc <470 ms.
7. ICD implantation can be useful in patients with a diagnosis of LQTS who experience recurrent syncopal events while on beta-blocker therapy.
8. LCSD can be useful in patients with a diagnosis of LQTS who experience breakthrough events while on therapy with beta-blockers/ICD.
9. Sodium channel blockers can be useful, as add-on therapy, for LQT3 patients with a QTc >500 ms who shorten their QTc by >40 ms following an acute oral drug test with one of these compounds.

Class III

10. Except under special circumstances, ICD implantation is not indicated in asymptomatic LQTS patients who have not been tried on beta-blocker therapy.

ACC/AHA/ESC 2006

Class IIa

1. Beta blockers can be effective to reduce SCD in patients with a molecular LQTS analysis and normal QT interval. (*Level of Evidence: B*)
2. Implantation of an ICD with continued use of beta blockers can be effective to reduce SCD in LQTS patients experiencing syncope and/or VT while receiving beta blockers and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)

Class IIb

1. Left cardiac sympathetic neural denervation may be considered for LQTS patients with syncope, torsades de pointes, or cardiac arrest while receiving beta blockers. (*Level of Evidence: B*)
2. Implantation of an ICD with the use of beta blockers may be considered for prophylaxis of SCD for patients in categories possibly associated with higher risk of cardiac arrest such as LQT2 and LQT3 and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)

HRS/EHRA/APHRS 2013

Class I

1. The following lifestyle changes are recommended in all patients with a diagnosis of LQTS:
 - a) Avoidance of QT-prolonging drugs (www.qtdrugs.org)
 - b) Identification and correction of electrolyte abnormalities that may occur during diarrhea, vomiting, metabolic conditions or imbalanced diets for weight loss.
2. Beta-blockers are recommended for patients with a diagnosis of LQTS who are:
 - a) Asymptomatic with QTc ≥ 470 ms *and/or*
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5. All LQTS patients who wish to engage in competitive sports should be referred to a clinical expert for evaluation of risk.

ACC/AHA/ESC 2006

Class I

1. Lifestyle modification is recommended for patients with an LQTS diagnosis (clinical and/or molecular). (*Level of Evidence: B*)
2. Beta blockers are recommended for patients with an LQTS clinical diagnosis (i.e., in the presence of prolonged QT interval). (*Level of Evidence: B*)
3. Implantation of an ICD along with use of beta blockers is recommended for LQTS patients with previous cardiac arrest and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: A*)

HRS/EHRA/APHS 2013

Class IIa

6. Beta-blockers can be useful in patients with a diagnosis of LQTS who are asymptomatic with QTc ≤ 470 ms.
7. ICD implantation can be useful in patients with a diagnosis of LQTS who experience recurrent syncopal events while on beta-blocker therapy.
8. LCSD can be useful in patients with a diagnosis of LQTS who experience breakthrough events while on therapy with beta-blockers/ICD.
9. Sodium channel blockers can be useful, as add-on therapy, for LQT3 patients with a QTc > 500 ms who shorten their QTc by > 40 ms following an acute oral drug test with one of these compounds.

Class III

10. Except under special circumstances, ICD implantation is not indicated in asymptomatic LQTS patients who have not been tried on beta-blocker therapy.

ACC/AHA/ESC 2006

Class IIa

1. Beta blockers can be effective to reduce SCD in patients with a molecular LQTS analysis and normal QT interval. (*Level of Evidence: B*)
2. Implantation of an ICD with continued use of beta blockers can be effective to reduce SCD in LQTS patients experiencing syncope and/or VT while receiving beta blockers and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)

Class IIb

1. Left cardiac sympathetic neural denervation may be considered for LQTS patients with syncope, torsades de pointes, or cardiac arrest while receiving beta blockers. (*Level of Evidence: B*)
2. Implantation of an ICD with the use of beta blockers may be considered for prophylaxis of SCD for patients in categories possibly associated with higher risk of cardiac arrest such as LQT2 and LQT3 and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)



Who Are the Long-QT Syndrome Patients Who Receive an Implantable Cardioverter-Defibrillator and What Happens to Them?: Data From the European Long-QT Syndrome Implantable Cardioverter-Defibrillator (LQTS ICD) Registry

Peter J. Schwartz, Carla Spazzolini, Silvia G. Priori, Lia Crotti, Alessandro Vicentini, Maurizio Landolina, Maurizio Gasparini, Arthur A.M. Wilde, Reinoud E. Knops, Isabelle Denjoy, Lauri Toivonen, Gerold Mönnig, Majid Al-Fayyadh, Luc Jordaens, Martin Borggrefe, Christina Holmgren, Pedro Brugada, Luc De Roy, Stefan H. Hohnloser and Paul A. Brink

Table 1. Baseline Characteristics of All Patients According to Genotype

	All Patients (n=233)	LQT1 (n=37)	LQT2 (n=61)	LQT3 (n=31)	Double Mutations (n=15)	P
Female gender, n (%)	180 (77)	31 (84)	50 (82)	20 (64)	8 (53)	0.032
QTc, ms*	516±65	524±65	512±59	484±66	593±82	<0.001
>500, n (%)	124 (54)	20 (54)	34 (57)	12 (40)	15 (100)	0.002
≤440, n (%)	31 (13)	2 (5)	7 (12)	10 (33)	0	0.002
FH-SCD, n (%)†	93 (41)	16 (44)	28 (47)	18 (60)	6 (46)	0.60
Pre-ICD symptoms (any cardiac event), n (%)	212 (91)	36 (97)	59 (97)	17 (55)	15 (100)	<0.001
ACA	102 (44)	16 (43)	27 (44)	8 (26)	7 (47)	
Syncopet‡	110 (47)	20 (54)	32 (52)	9 (29)	8 (53)	
Asymptomatic	21 (9)	1 (3)	2 (3)	14 (45)	0	
On therapy, n (%)	138 (59)	29 (78)	41 (67)	12 (39)	13 (87)	0.001
β-blockers	133 (96)	29 (100)	40 (98)	9 (75)	13 (100)	
Sodium channel blockers	14 (10)	1 (3)	1 (2)	5 (42)	0	
Pacemaker	19 (14)	3 (10)	1 (2)	1 (8)	2 (15)	
LCSD	26 (19)	3 (10)	8 (19)	2 (17)	6 (46)	
Events on therapy, n (%)	107 (78)	24 (83)	30 (73)	5 (42)	12 (92)	0.018
Median age at first event (IQR), y	18 (7–33)	14 (5–27)	17 (13–25)	17 (11–40)	2 (0–3)	<0.001
Median age at implantation (IQR), y	29 (16–40)	31 (17–53)	28 (18–35)	27 (16–43)	13 (8–23)	0.004

Table 2. Rhythm Responsible for ICD Shock Episodes

	Patients, n	Shocks, n
Appropriate*	63	1159
Ventricular tachyarrhythmia in VF zone†	24	194
Ventricular tachyarrhythmia in VT zone‡	18	329
Both tachyarrhythmias in VT/VF zone	21	636
Unclassified		
Median event count per patient (IQR)		
Incidence rate per 100 person-years		
Mean yearly event rate		
Inappropriate	18	86
Atrial fibrillation	1	2
Supraventricular tachycardia	7	21
Abnormal sensing	9	51
Lead fracture/dislodgment	3	12
Unclassified*	6	
Median event count per patient (IQR)	0 (0–0)	
Incidence rate per 100 person-years (95% CI)§	2.0 (1.2–3.2)	
Mean yearly event rate	0.08 (0.07–0.1)	

28% de chocs appropriés

Table 6. Complications After ICD Implantation*

Total patients with at least 1 adverse event, n	58
Major adverse events	
Pericardial tamponade	1
Cardiac perforation with or without pericardial effusion	3
Lead revision requiring open chest surgery	2
Device-related infection/endocarditis	7
Right atrial thrombosis	1
Stroke	1
Total major adverse events, n	15
Minor adverse events	
Lead-related	24
Lead fracture	7
Lead dislodgment	9
Chamber lead perforation	7
Exit block	1
Device-related overall	10
Device dislodgment requiring repositioning	4
Device malfunction requiring replacement/elective upgrading	6
Others	6
Phlebitis	1
Peripheral nerve injury	1
Keloid	3
Decubitus	1
Total minor adverse events, n	40
Manufacturers' advisories with or without replacements*	
Pulse generator	7
Lead	5
Total recalls, n	12

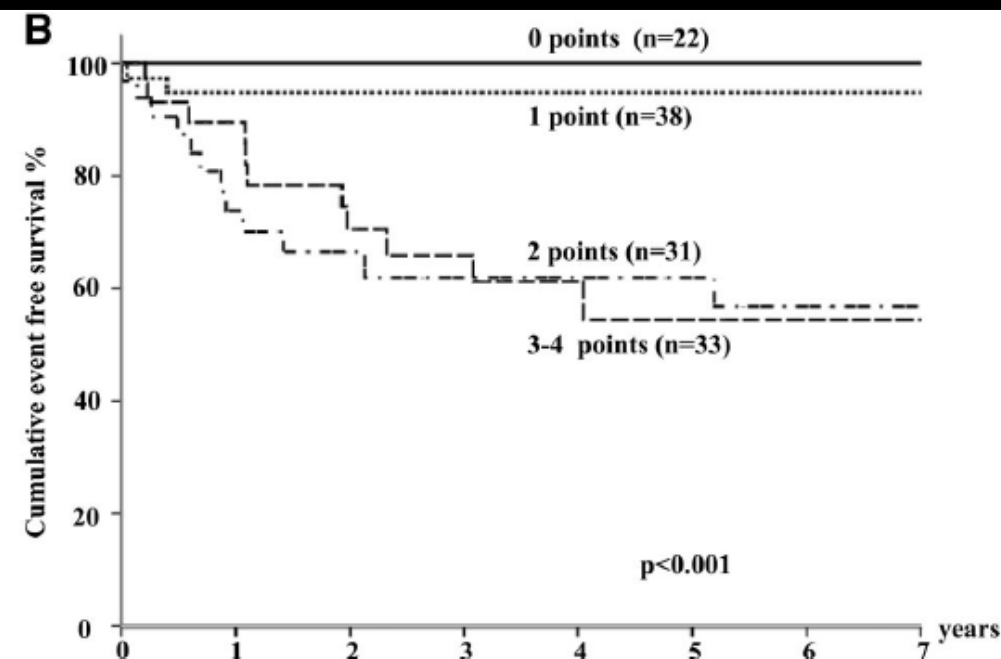
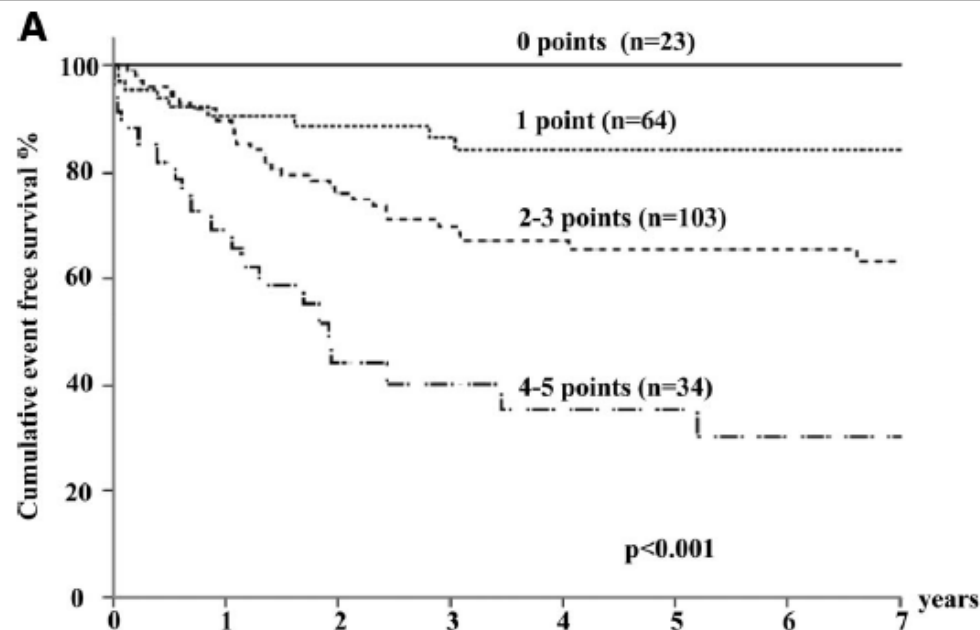
25% de complications

Who Are the Long-QT Syndrome Patients Who Receive an Implantable Cardioverter-Defibrillator and What Happens to Them?: Data From the European Long-QT Syndrome Implantable Cardioverter-Defibrillator (LQTS ICD) Registry
Peter J. Schwartz, Carla Spazzolini, Silvia G. Priori, Lia Crotti, Alessandro Vicentini, Maurizio Landolina, Maurizio Gasparini, Arthur A.M. Wilde, Reinoud E. Knops, Isabelle Denjoy, Lauri Toivonen, Gerold Mönig, Majid Al-Fayyadh, Luc Jordaens, Martin Borggrefe, Christina Holmgren, Pedro Brugada, Luc De Roy, Stefan H. Hohnloser and Paul A. Brink

Circulation. 2010;122:1272-1282; originally published online September 13, 2010;

Table 5. M-FACT* Risk Score

	−1 Point	0 Points	1 Point	2 Points
Event-free on therapy for >10 y	Yes			
QTc, ms		≤500	>500–≤550	>550
Prior ACA		No	Yes	
Events on therapy		No	Yes	
Age at implantation, y		>20	≤20	



HRS/EHRA/APQRS 2013

Class I

1. The following lifestyle changes are recommended in all patients with a diagnosis of LQTS:
 - a) Avoidance of QT-prolonging drugs (www.qtdrugs.org)
 - b) Identification and correction of electrolyte abnormalities that may occur during diarrhea, vomiting, metabolic conditions or imbalanced diets for weight loss.
2. Beta-blockers are recommended for patients with a diagnosis of LQTS who are:
 - a) Asymptomatic with QTc ≥ 470 ms *and/or*
 - b) Symptomatic for syncope or documented ventricular tachycardia/ventricular fibrillation (VT/VF).
3. Left cardiac sympathetic denervation (LCSD) is recommended for high-risk patients with a diagnosis of LQTS in whom:
 - a) Implantable cardioverter defibrillator (ICD) therapy is contraindicated or refused *and/or*
 - b) Beta-blockers are either not effective in preventing syncope/arrhythmias, not tolerated, not accepted or contraindicated.
4. ICD implantation is recommended for patients with a diagnosis of LQTS who are survivors of a cardiac arrest.
5. All LQTS patients who wish to engage in competitive sports should be referred to a clinical expert for evaluation of risk.

ACC/AHA/ESC 2006

Class IIb

1. Left cardiac sympathetic neural denervation may be considered for LQTS patients with syncope, torsades de pointes, or cardiac arrest while receiving beta blockers. (*Level of Evidence: B*)
2. Implantation of an ICD with the use of beta blockers may be considered for prophylaxis of SCD for patients in categories possibly associated with higher risk of cardiac arrest such as LQT2 and LQT3 and who have reasonable expectation of survival with a

HRS/EHRA/APHRs 2013

Class IIa

6. Beta-blockers can be useful in patients with a diagnosis of LQTS who are asymptomatic with $QTc \leq 470$ ms.
7. ICD implantation can be useful in patients with a diagnosis of LQTS who experience recurrent syncopal events while on beta-blocker therapy.
8. LCSD can be useful in patients with a diagnosis of LQTS who experience breakthrough events while on therapy with beta-blockers/ICD.
9. Sodium channel blockers can be useful, as add-on therapy, for LQT3 patients with a $QTc > 500$ ms who shorten their QTc by > 40 ms following an acute oral drug test with one of these compounds.

Class III

10. Except under special circumstances, ICD implantation is not indicated in asymptomatic LQTS patients who have not been tried on beta-blocker therapy.

ACC/AHA/ESC 2006

Class IIa

1. Beta blockers can be effective to reduce SCD in patients with a molecular LQTS analysis and normal QT interval. (*Level of Evidence: B*)
2. Implantation of an ICD with continued use of beta blockers can be effective to reduce SCD in LQTS patients experiencing syncope and/or VT while receiving beta blockers and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)

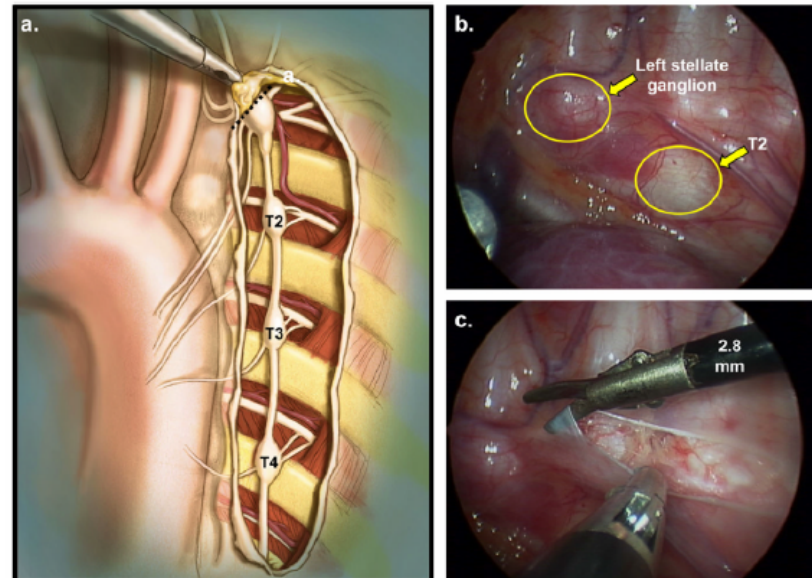
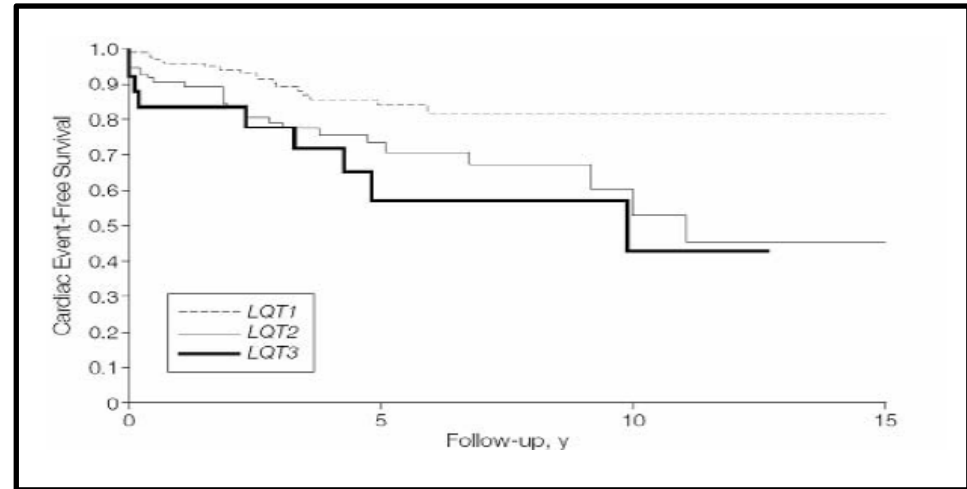
Class IIb

1. Left cardiac sympathetic neural denervation may be considered for LQTS patients with syncope, torsades de pointes, or cardiac arrest while receiving beta blockers. (*Level of Evidence: B*)
2. Implantation of an ICD with the use of beta blockers may be considered for prophylaxis of SCD for patients in categories possibly associated with higher risk of cardiac arrest such as LQT2 and LQT3 and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: B*)

Syndrome du QT Long congénital

Traitement

- Bêtabloquants (BB)
 - Symptomatiques
 - Asymptomatiques
 - Génétique positive
- Sympatectomie (LCSD)



Left Cardiac Sympathetic Denervation in the Management of High-Risk Patients Affected by the Long-QT Syndrome

Peter J. Schwartz, Silvia G. Priori, Marina Cerrone, Carla Spazzolini, Attilio Odero, Carlo Napolitano, Raffaella Bloise, Gaetano M. De Ferrari, Catherine Klersy, Arthur J. Moss, Wojciech Zareba, Jennifer L. Robinson, W. Jackson Hall, Paul A. Brink, Lauri Toivonen, Andrew E. Epstein, Cuilan Li and Dayi Hu

Circulation. 2004;109:1826-1833; originally published online March 29, 2004;

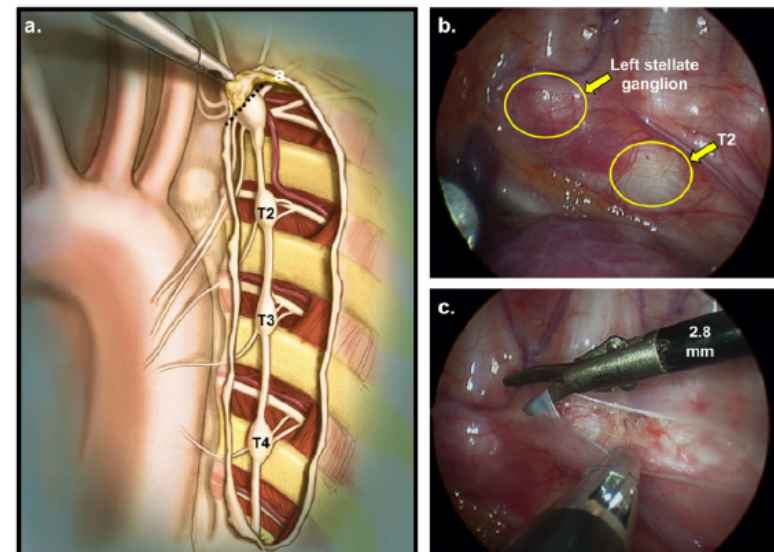


TABLE 2. Effect of LCSD on the Rate of Events During Follow-Up

	Patients, n	Median Event Count per Patient (IQR)	Mean Annual Event Rate (95% CI)*	IRR (95% CI)	Change in Expected Count, %	P
Any event						
Before LCSD	139/141	6 (3–11)	1.32 (1.25–1.40)	1		
After LCSD	77/141	1 (0–2)	0.19 (0.17–0.22)	0.09 (0.06–0.14)	91	<0.001
ACA/SD						
Before LCSD	65/141	0 (0–1)	0.13 (0.11–0.15)	1		
After LCSD	32/141	0 (0–0)	0.06 (0.04–0.07)	0.44 (0.19–0.98)	56	0.046
Any event (patients with syncope only)						
Before LCSD	74/74	5 (3–10)	1.23 (1.13–1.33)	1		
After LCSD	41/74	1 (0–2)	0.24 (0.20–0.28)	0.09 (0.05–0.17)	91	<0.001

En résumé:

Liste des médicaments CI (www.qtdrugs.org)

Bétabloquants (BB) chez tous les LQTS

- Symptomatiques
- Asymptomatiques
- Génétique positive

DAI chez les patients à haut risque

- Mort subite récupérée (sauf enfant LQT1???)
- Récidive des syncopes malgré BB + LCSD

Sympathectomie (LCSD)

- Alternative aux BB
- Syncope sous BB
- DAI + Orage rythmique
- Alternative au DAI chez l'enfant à HR ???

Evaluation individuelle pour la pratique de sports
intenses ou de compétition

Syndrome du QT Long congénital

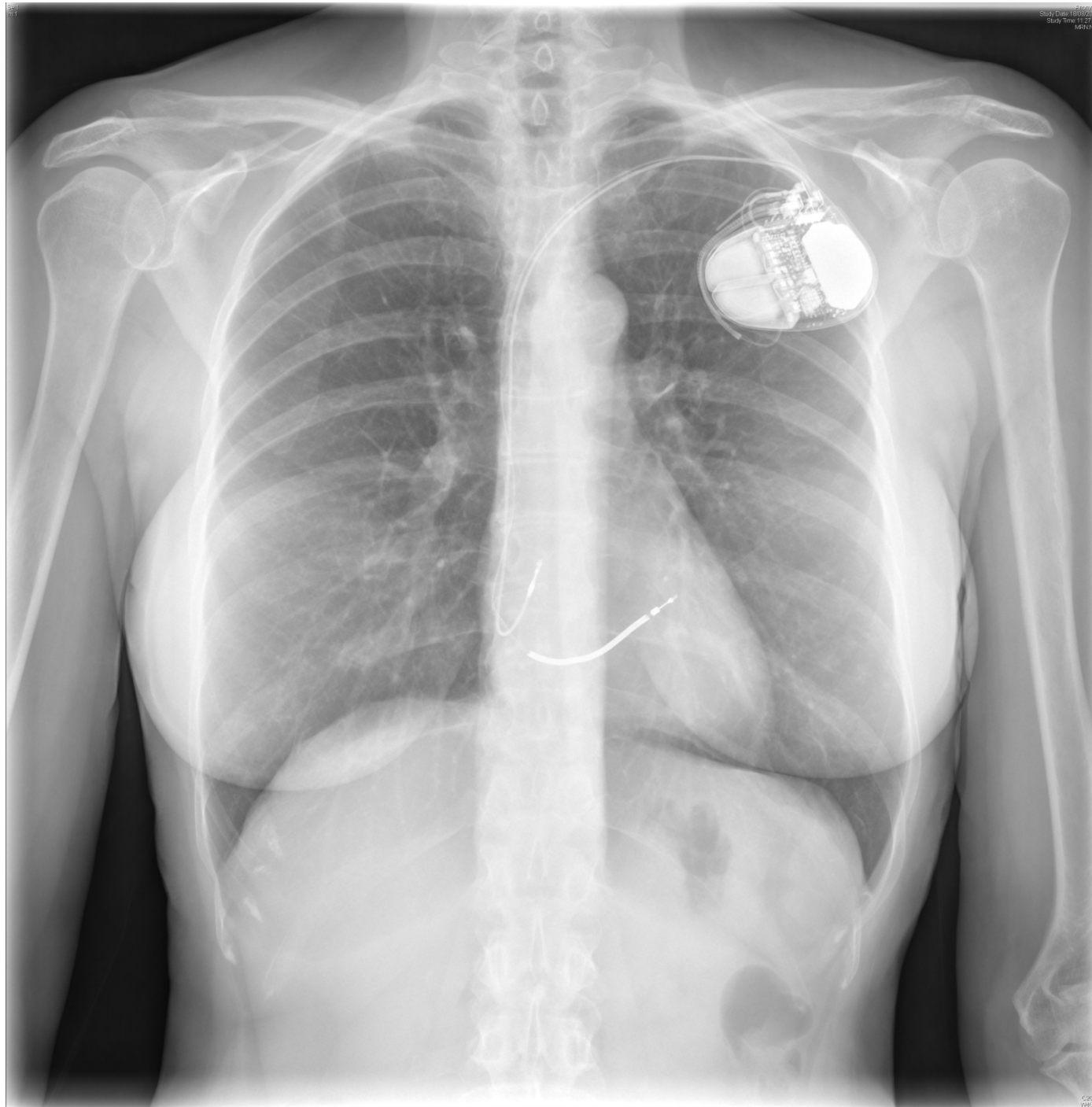
Traitement

- Défibrillateur automatique implantable

Patients à haut risque

Mort subite récupérée

Récidive des syncopes malgré BB + LCSD



+ Nadolol 80 x 1
+ Aldactone
+ Conseils

Syndrome du QT Long congénital

Traitement

- Liste des médicaments CI
(www.qtdrugs.org)
- Contre indication sport intense ou de compétition
- Prélèvement et conseil génétique
- Dépistage familial +++ (apparentés au premier degré)

Diagnostic génétique du syndrome du QT long congénital

Recherche de mutation dans le gène KCNQ1

Famille N° B843
Prélèvement N° QT4436

Méthodes :

PCR-Séquençage direct

Screening du gène KCNQ1

Résultat:

Présence d'une première mutation

Transition C>T dans l'exon 2 (position 520 du cDNA)
donnant la mutation Arg 174 Cys (R174C).

Le syndrome du QT Long Congénital (QTL)

 Aspects cardiologies

- ✦ Cardiomyopathie Dilatée (CMD)
- ✦ Cardiomyopathie Hypertrophique (CMH)
- ✦ Dysplasie Ventriculaire Droite Arythmogène (DVDA)
- ✦ Le syndrome du QT Long Congénital (QTL)
- ✦ Syndrome de Brugada
- ✦ Tachycardie ventriculaire catécholergique (TVC)

 Aspects génétiques

- #### Le conseil génétique et le test génétique

 Agenda

- ✚ "3e Journée nationale des maladies cardiaques héréditaires, le 09 février 2013"
- ✚ 05/04/2014 Journée des maladies cardiaques

Fiche sports :

Recommandations pour la participation aux activités sportives de loisirs pour les patients atteints du syndrome du QT long. Le sport en compétition est formellement interdit. Les recommandations qui suivent concernent l'activité de loisir et sont données à titre indicatif et doivent être adaptées au cas par cas (selon les symptômes, les résultats du bilan cardiologique précis, l'effet contrôlé du traitement médicamenteux), en accord avec le cardiologue du patient. D'une fa(....) [Lire la suite](#)

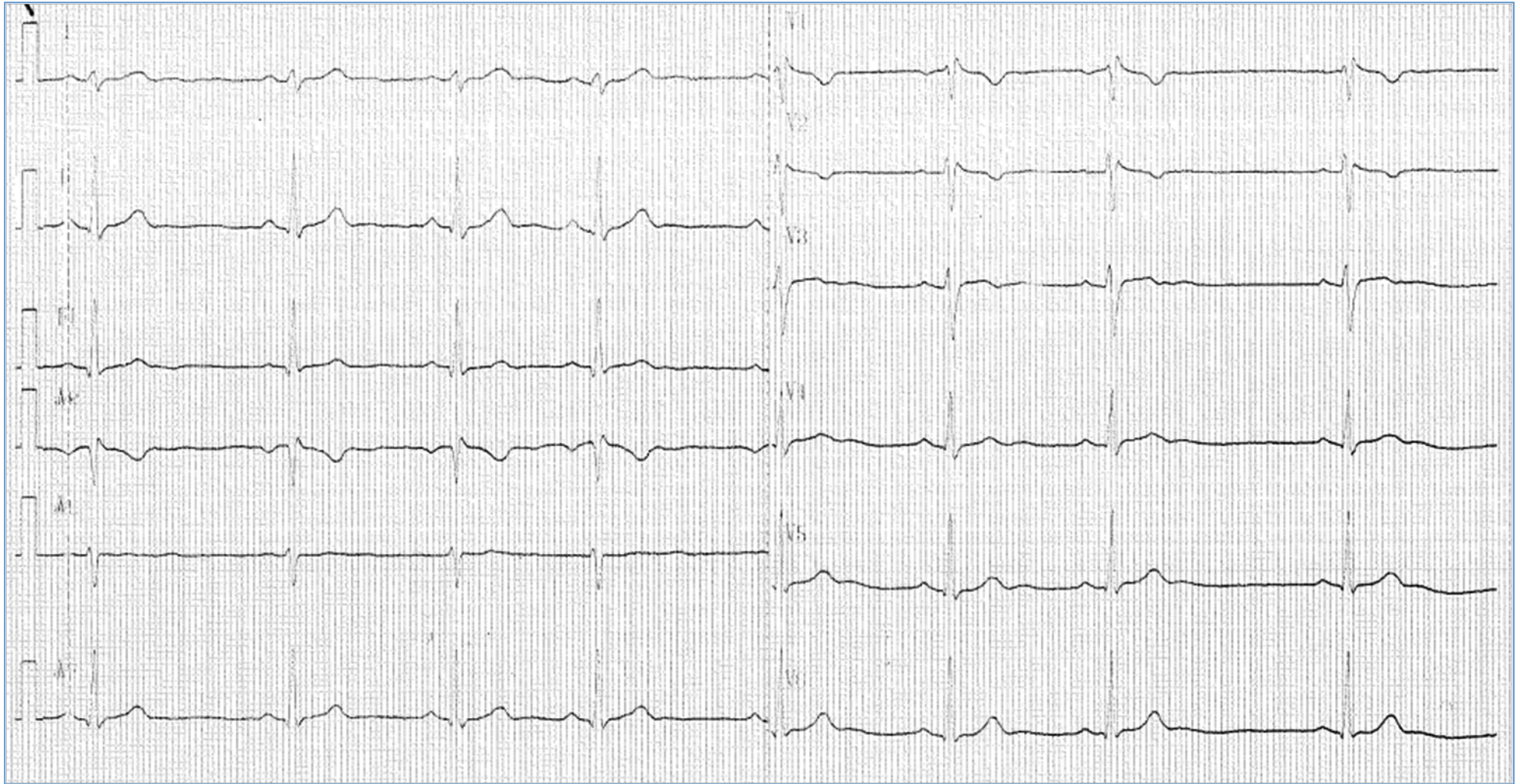
Liste de médicaments :

Médicaments contre-indiqués, déconseillés ou à utiliser avec précaution dans le syndrome du QT long congénital Voir en ligne : Pour plus de renseignement, voir le site web : Centre de Référence pour les maladies cardiaques héréditaires, Paris La liste des médicaments suivants doit dans tous les cas être discutée avec le cardiologue traitant, de façon à adapter la liste à la situation de chaque patient. Les médicaments contre-indiqués sont ceux pour lesquels des complications de type torsades(...) [Lire la suite »](#)

Observation 2

- Mlle D... 18 ans
- Asymptomatique (Syncopes? Endormissements? Spasmophilie?)
- Mort subite chez le père (syndrome de Brugada?)
- Adressée pour évaluation du risque rythmique

Syndrome de Brugada?

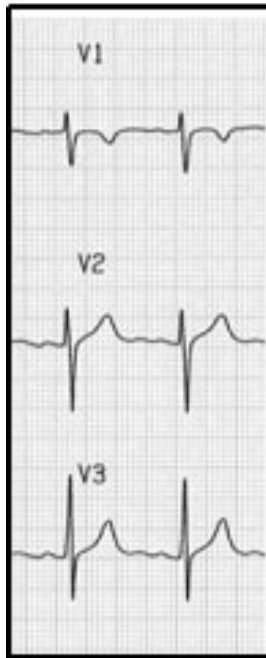


Syndrome de Brugada

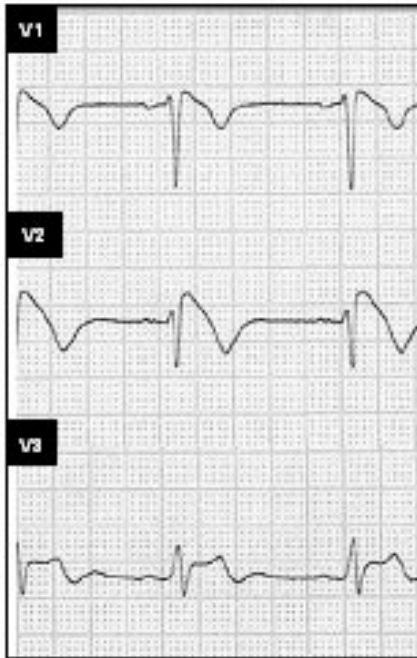
Diagnostic

ECG

Sus déclage en dôme du segment ST de + 2 mm dans les dérivation V1 ou V2 de façon spontané ou induit par un antiarythmique de classe I



ECG normal



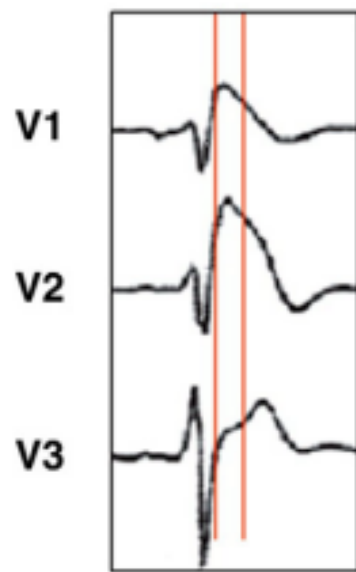
Type I



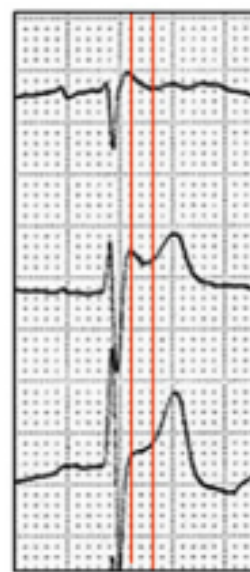
Type II



Type III



Coved type



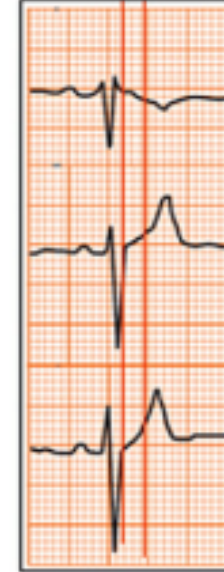
**Saddle back
type**



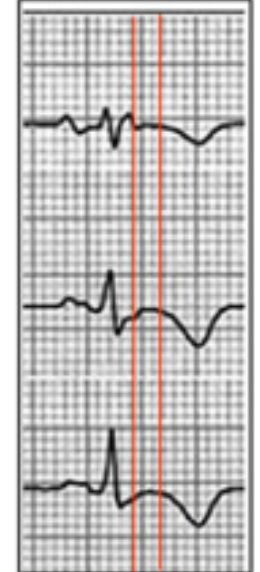
**Pectus
excavatum**



Athletes



**Incomplete
RBBB**



ARVD

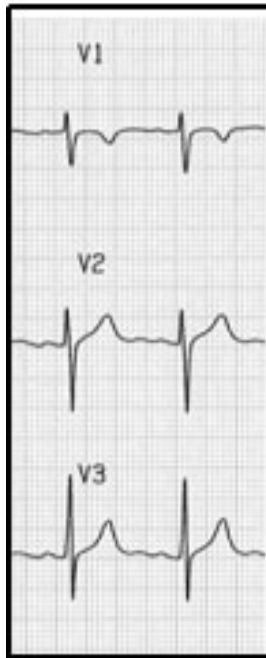
- Conduite à tenir
 - Diagnostique
 - Thérapeutique

Syndrome de Brugada

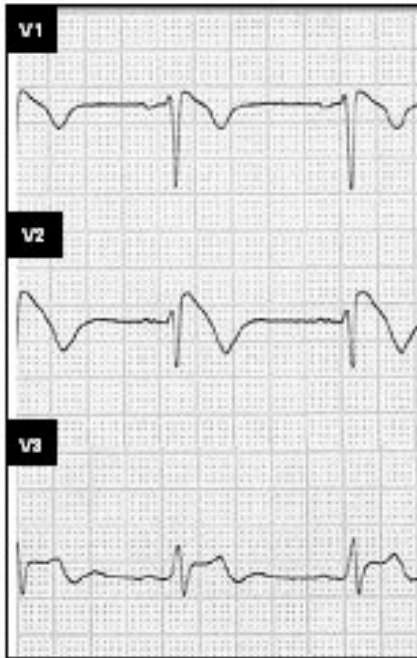
Diagnostic

ECG

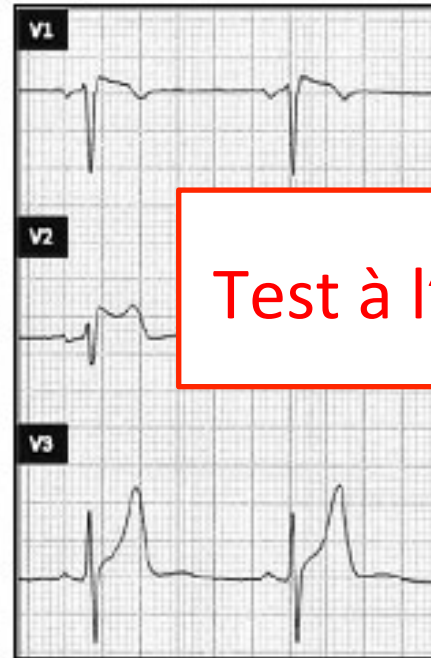
Sus déclage en dôme du segment ST de + 2 mm dans les dérivations V1 ou V2 de façon spontanée ou induite par un antiarythmique de classe I



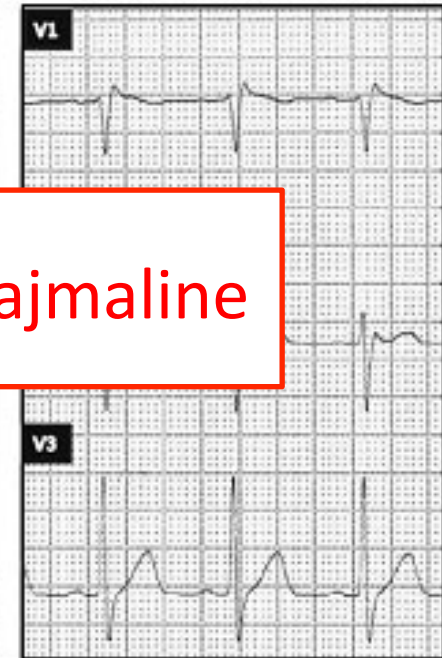
ECG normal



Type I

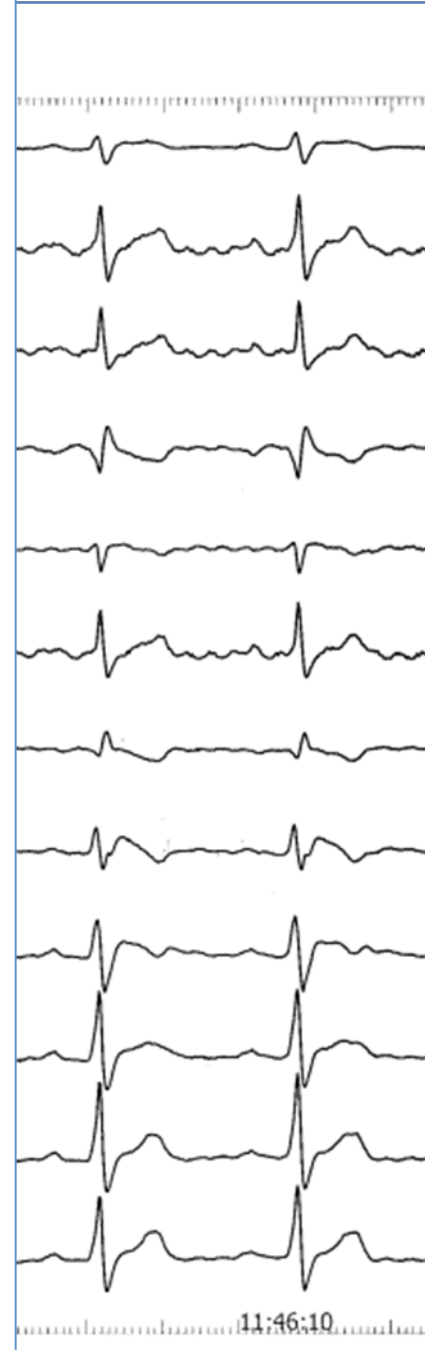
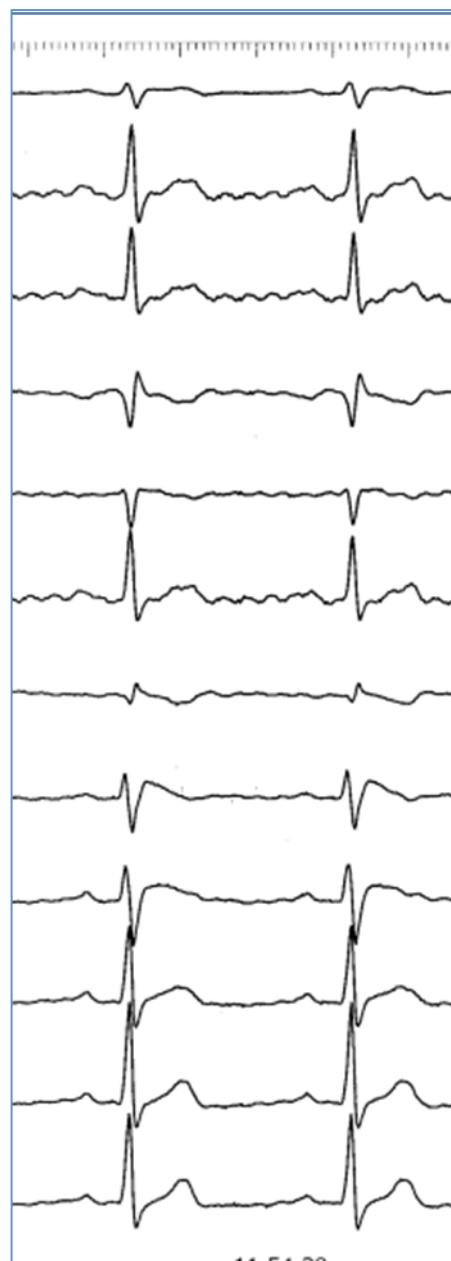
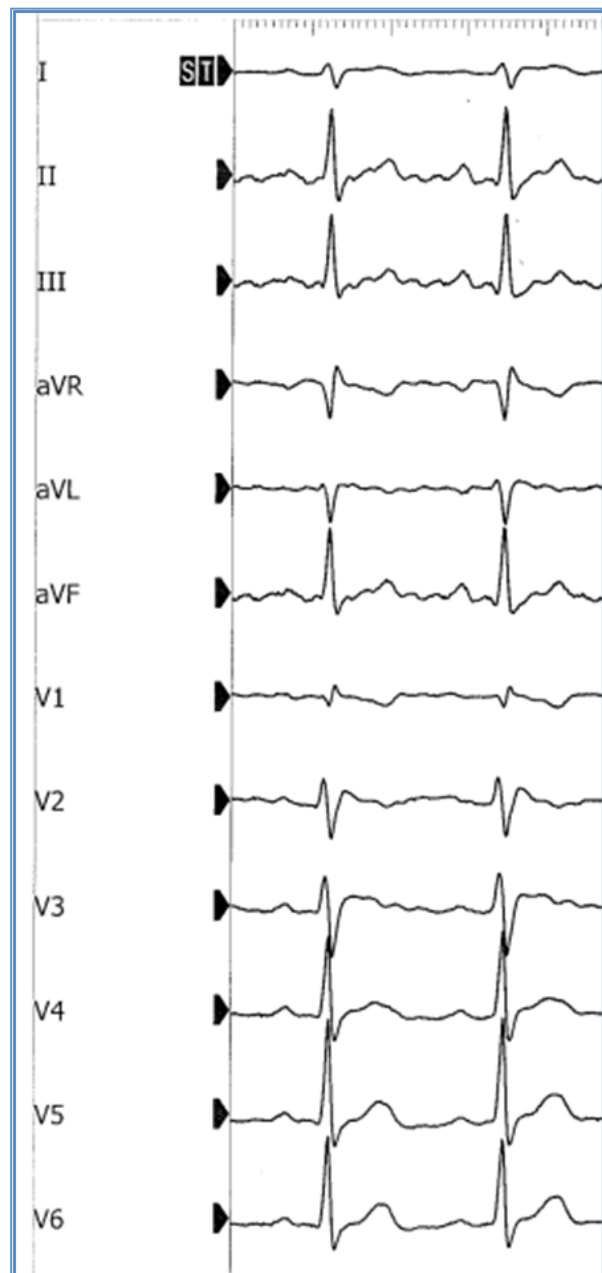


Type II



Type III

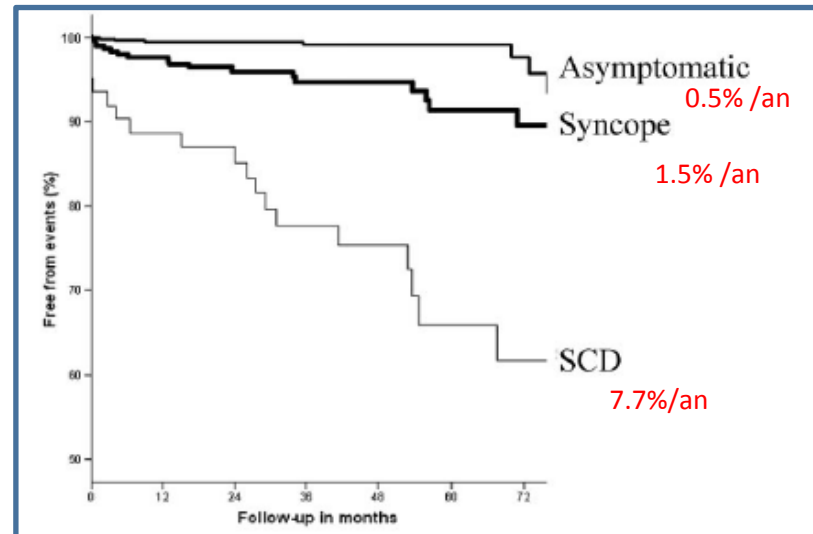
Test à l'ajmaline



Syndrome de Brugada

Pronostic

Taux d'évènement rythmique annuel



Risque mort subite par fibrillation ventriculaire (20% symptômes préalable)

Facteurs de risque { Aspect spontané de type I
Syncope

ATCD de mort subite familial: non

Syndrome de Brugada

Traitement

- ✓ Liste des médicaments contre indiqués
(www.brugadadrugs.org)
 - ✓ Surveillance de l'apparition de symptômes
 - ✓ Traitement de la fièvre
 - ❖ Défibrillateur automatique implantable
 - Syncope
 - Mort subite récupérée
 - 25% de complications chez le sujet jeune*
 - ❖ Traitement antiarythmique de classe IA (quinidine)
 - ✓ Dépistage familial
- { Chocs inappropriés
Fracture de sonde

***Diagnostic génétique du syndrome de QT long congénital
ou de trouble du rythme ventriculaire (Brugada)***
Recherche de mutation dans le gène SCN5A

Famille N° B1526
Prélèvements N° QT6128

Méthodes :

PCR-Séquençage direct

Screening du gène SCN5A

Résultats:

Présence de mutation à l'état hétérozygote .

Identification de la mutation:

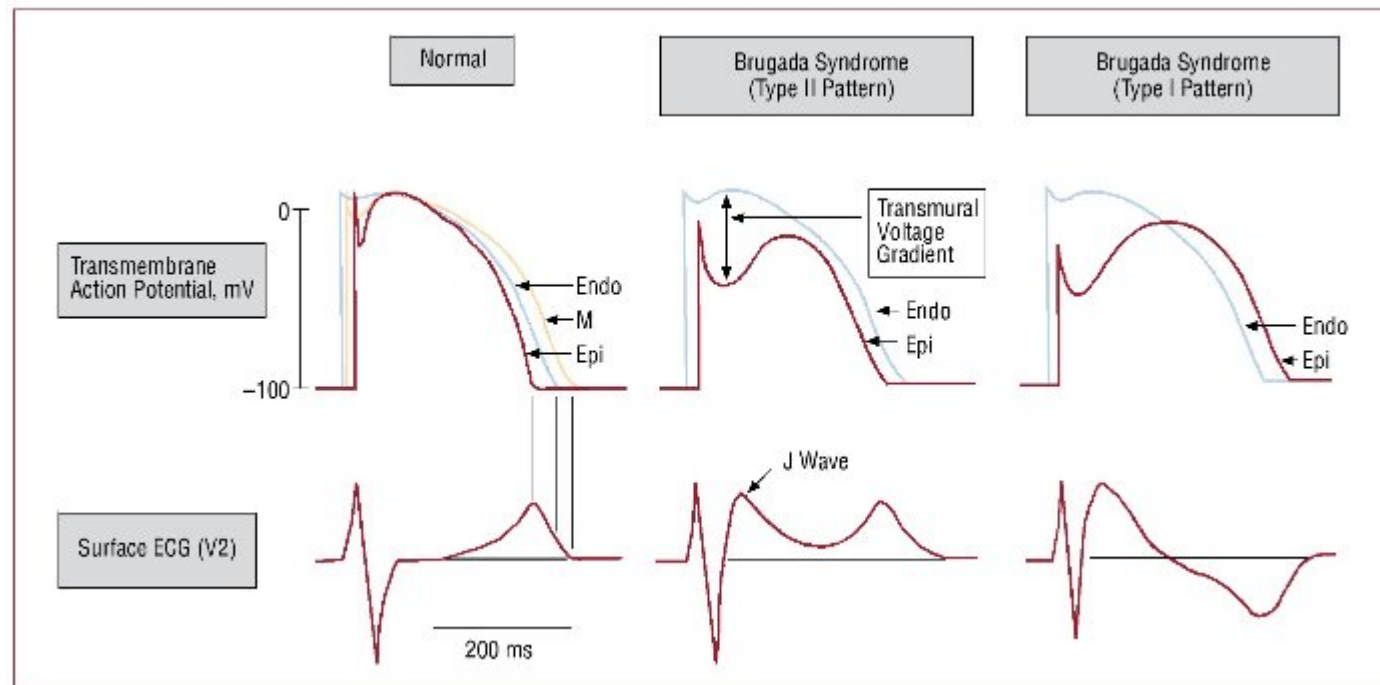
Mutation non-sens dans l'exon 16 du gène:
c.2711G>A, p.Trp904X.

Syndrome de Brugada

Prévalence

1/2000 (0.05% de la population), Asie+++
20% des morts subites sur cœur sain

Physiopathologie



Syndrome de Brugada

Clinique

Age moyen 40 ans

Prédominance masculine (8 H/1F)

Syncope +/- convulsions

Pertes d'urines nocturnes inexpliquées ou respiration stertoreuse

Mort subite « nocturne »

Facteur favorisant: la fièvre +++

Syndrome de Brugada

Génétique

Mode de transmission Autosomique Dominant

Pénétrance incomplète +++

Relation génotype/ phénotype complexe >>>> dépistage et suivi familial

1 gène principal SCN5A → INa (perte de fonction)

300 mutations

**Mutations +
20% des cas**

Syndrome de Brugada

HRS/EHRA/APHRS 2013

Expert Consensus Recommendations on Brugada Syndrome Diagnosis

1. BrS is diagnosed in patients with ST-segment elevation with type 1 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.

Ancienne définition Consensus 2005:

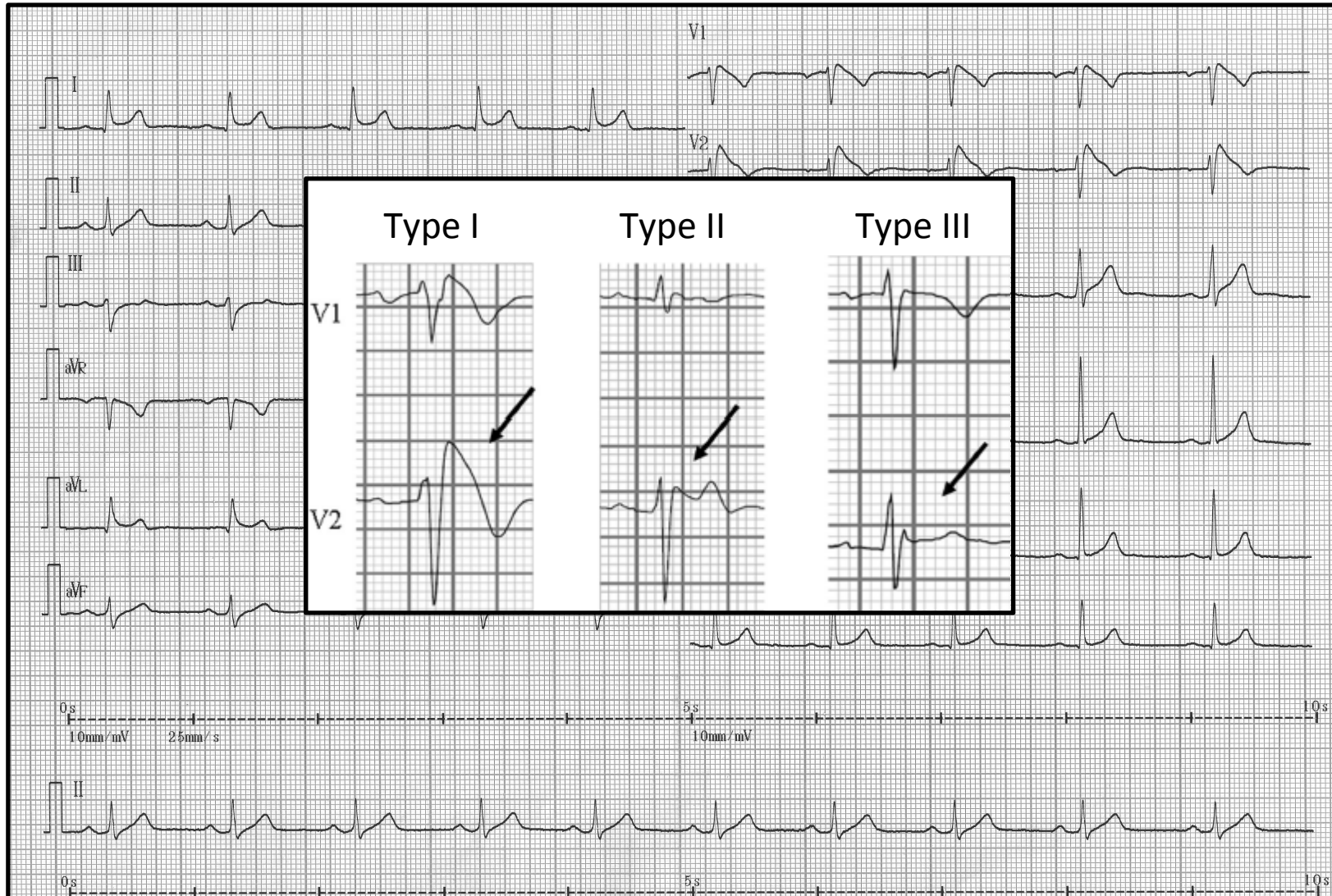
> 1 dérivation (V_1 - V_3)

+

- FV/TV polymorphe
- ATCD Fam Mort subite
- Aspect type I famille
- EEP +
- Syncope ou respi agonique

Antzelevitch C. Circulation 2005.

Syndrôme de Brugada



HRS/EHRA/APHRs 2013

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 (for example, visit 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.

ACC/AHA/ESC 2006

Class I

An ICD is indicated for Brugada syndrome patients with previous cardiac arrest receiving chronic optimal medical therapy and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)

HRS/EHRA/APHRS 2013

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 (for example, visit 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.

ACC/AHA/ESC 2006

Class I

An ICD is indicated for Brugada syndrome patients with previous cardiac arrest receiving chronic optimal medical therapy and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)

HRS/EHRA/APHRS 2013

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:
 - a) Who 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.

ACC/AHA/ESC 2006

Class IIa

1. An ICD is reasonable for Brugada syndrome patients with spontaneous ST-segment elevation in V₁, V₂, or V₃ who have had syncope with or without mutations demonstrated in the *SCN5A* gene and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)
2. Clinical monitoring for the development of a spontaneous ST-segment elevation pattern is reasonable for the management of patients with ST-segment elevation induced only with provocative pharmacological challenge with or without symptoms. (*Level of Evidence: C*)
3. An ICD is reasonable for Brugada syndrome patients with documented VT that has not resulted in cardiac arrest and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)
4. Isoproterenol can be useful to treat an electrical storm in the Brugada syndrome. (*Level of Evidence: C*)

HRS/EHRA/APQRS 2013

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 SCD alone.

ACC/AHA/ESC 2006

Class IIb

1. EP testing may be considered for risk stratification in asymptomatic Brugada syndrome patients with spontaneous ST elevation with or without a mutation in the *SCN5A* gene. (*Level of Evidence: C*)
2. Quinidine might be reasonable for the treatment of electrical storm in patients with Brugada syndrome. (*Level of Evidence: C*)

Outcome After Implantation of a Cardioverter-Defibrillator in Patients With Brugada Syndrome: A Multicenter Study

Frédéric Sacher, Vincent Probst, Yoshito Iesaka, Peggy Jacon, Julien Laborderie, Frédérique Mizon-Gérard, Philippe Mabo, Sylvain Reuter, Dominique Lamaison, Yoshihide Takahashi, Mark D. O'Neill, Stéphane Garrigue, Bertrand Pierre, Pierre Jaïs, Jean-Luc Pasquié, Méléze Hocini, Michèle Salvador-Mazenq, Akihiko Nogami, Alain Amiel, Pascal Defaye, Pierre Bordachar, Serge Boveda, Philippe Maury, Didier Klug, Dominique Babuty, Michel Haïssaguerre, Jacques Mansourati, Jacques Clémenty and Hervé Le Marec

Circulation. 2006;114:2317-2324; originally published online November 20, 2006;

TABLE 1. Initial Characteristics of the 220 Patients With Brugada Syndrome According to ICD Indication

	Resuscitated SCD (n=18)	Syncope (n=88)	Asymptomatic (n=114)	P Between 3 Groups	Total (n=220)
Sex, male	15 (83)	72 (82)	96 (84)	0.64	183 (83)
Age, y	43±13	46±12	46±12	0.57	46±12
Ethnicity				0.11	
White	15 (83)	81 (92)	109 (96)		205 (93)
Asian	2 (11)	7 (8)	3 (3)		12 (6)
African	1 (6)	0	2 (1)		3 (1)
Family history of SCD	6 (33)	23 (26)	62 (54)	0.001	91 (41)
History of supraventricular tachycardia	0 (0)	13 (15)	19 (17)	0.21	32 (15)
Spontaneous type 1 ECG	13 (72)	63 (71)	61 (54)	0.037	137 (62)
No. of patients with EPS	11 (61)	77 (88)	110 (96)	0.01	198 (90)
Inducible at EPS	4 (36)	58 (75)	95 (86)	<0.001	157 (79)
Single-chamber ICD	15 (83)	78 (88)	103 (90)	0.55	196 (89)
Patients with genetic test	9 (50)	38 (43)	50 (44)	0.65	97 (44)
SCN5a mutation	5 (56)	6 (16)	18 (36)	0.11	29 (30)

Outcome After Implantation of a Cardioverter-Defibrillator in Patients With Brugada Syndrome: A Multicenter Study

Frédéric Sacher, Vincent Probst, Yoshito Iesaka, Peggy Jacon, Julien Laborderie, Frédérique Mizon-Gérard, Philippe Mabo, Sylvain Reuter, Dominique Lamaison, Yoshihide Takahashi, Mark D. O'Neill, Stéphane Garrigue, Bertrand Pierre, Pierre Jaïs, Jean-Luc Pasquié, Méléze Hocini, Michèle Salvador-Mazenq, Akihiko Nogami, Alain Amiel, Pascal Defaye, Pierre Bordachar, Serge Boveda, Philippe Maury, Didier Klug, Dominique Babuty, Michel Haïssaguerre, Jacques Mansourati, Jacques Clémenty and Hervé Le Marec

Circulation. 2006;114:2317-2324; originally published online November 20, 2006;

TABLE 1. Initial Characteristics of the 220 Patients With Brugada Syndrome According to ICD Indication

				Between Groups	Total (n=220)
Sex, male	Suivi à 3 ans 8% chocs appropriés 28% chocs inappropriés			0.64	183 (83)
Age, y				0.57	46±12
Ethnicity				0.11	
White					205 (93)
Asian					12 (6)
African					3 (1)
Family history of SCD				0.001	91 (41)
History of supraventricular tachycardia				0.21	32 (15)
Spontaneous type 1 ECG	13 (72)	63 (71)	61 (54)	0.037	137 (62)
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Patients with genetic test	9 (50)	38 (43)	50 (44)	0.65	97 (44)
SCN5a mutation	5 (56)	6 (16)	18 (36)	0.11	29 (30)

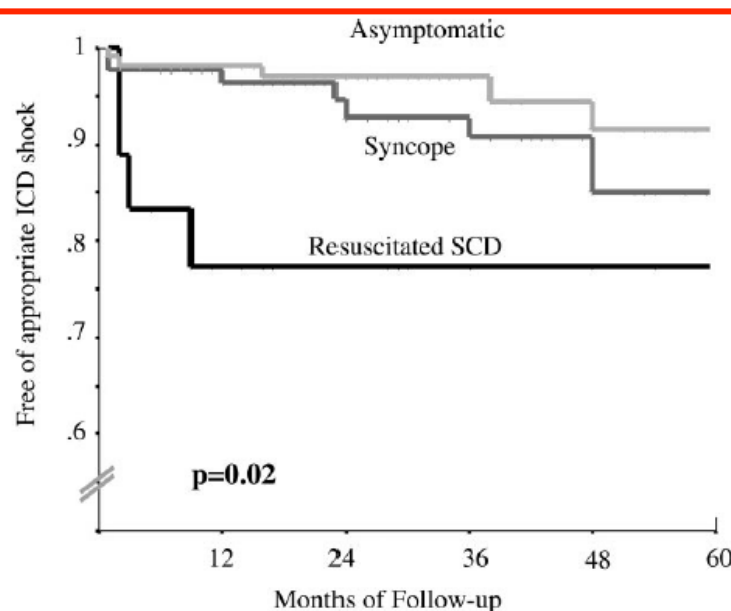
Outcome After Implantation of a Cardioverter-Defibrillator in Patients With Brugada Syndrome: A Multicenter Study

Frédéric Sacher, Vincent Probst, Yoshito Iesaka, Peggy Jacon, Julien Laborderie, Frédérique Mizon-Gérard, Philippe Mabo, Sylvain Reuter, Dominique Lamaison, Yoshihide Takahashi, Mark D. O'Neill, Stéphane Garrigue, Bertrand Pierre, Pierre Jaïs, Jean-Luc Pasquie, Méléze Hocini, Michèle Salvador-Mazenq, Akihiko Nogami, Alain Amiel, Pascal Defaye, Pierre Bordachar, Serge Boveda, Philippe Maury, Didier Klug, Dominique Babuty, Michel Haïssaguerre, Jacques Mansourati, Jacques Clémenty and Hervé Le Marec

Circulation. 2006;114:2317-2324; originally published online November 20, 2006;

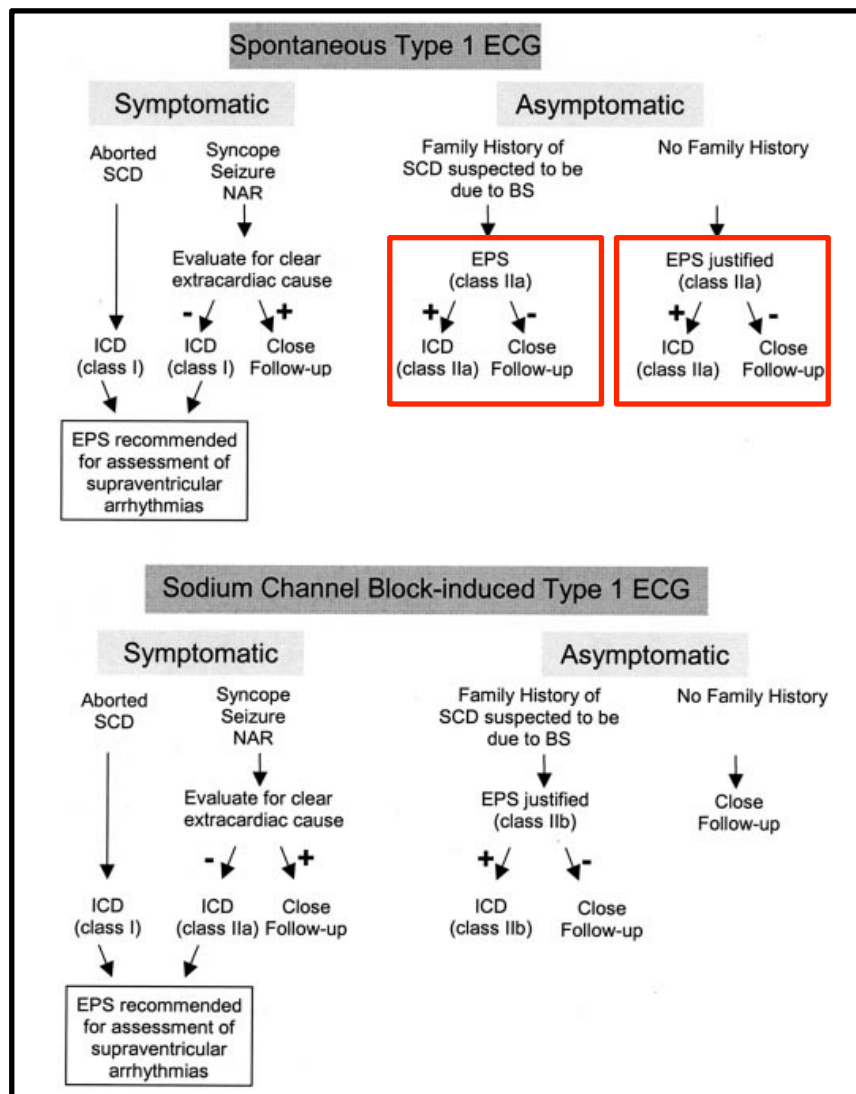
TABLE 1. Initial Characteristics of the 220 Patients With Brugada Syndrome According to ICD Indication

	Between Groups			Total (n=220)
Sex, male	0.64			183 (83)
Age, y	0.57			46±12
Ethnicity	0.11			
White				205 (93)
Asian				12 (6)
African				3 (1)
Family history of SCD	0.001			91 (41)
History of supraventricular tachycardia	0.21			32 (15)
Spontaneous type 1 ECG	0.037			137 (62)
No. of patients with EPS	0.01			198 (90)
Inducible at EPS	0.001			157 (79)
Single-chamber ICD	0.55			196 (89)
Patients with genetic test	0.65			97 (44)
SCN5a mutation	0.11			29 (30)



**Brugada Syndrome: Report of the Second Consensus Conference: Endorsed by the Heart
Rhythm Society and the European Heart Rhythm Association**

Charles Antzelevitch, Pedro Brugada, Martin Borggrefe, Josep Brugada, Ramon Brugada,
Domenico Corrado, Ihor Gussak, Herve LeMarec, Koonlawee Nademanee, Andres Ricardo
Perez Riera, Wataru Shimizu, Eric Schulze-Bahr, Hanno Tan and Arthur Wilde



HRS/EHRA/APHRS 2013

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 SCD alone.

ACC/AHA/ESC 2006

Class IIb

1. EP testing may be considered for risk stratification in asymptomatic Brugada syndrome patients with spontaneous ST elevation with or without a mutation in the *SCN5A* gene. (*Level of Evidence: C*)
2. Quinidine might be reasonable for the treatment of electrical storm in patients with Brugada syndrome. (*Level of Evidence: C*)

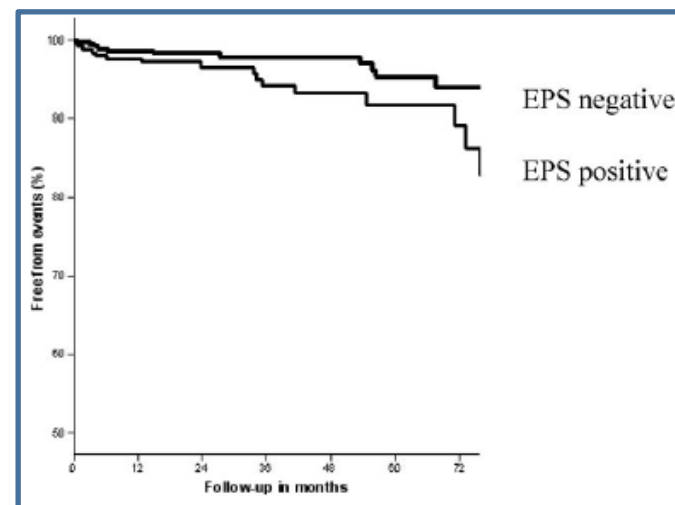
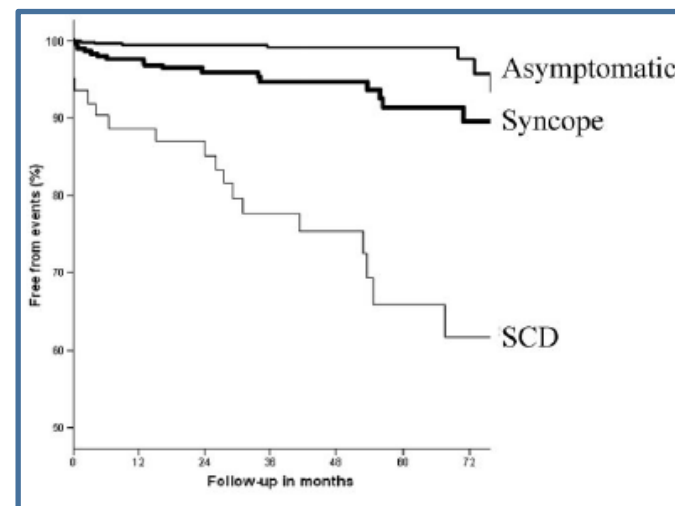
Long-Term Prognosis of Patients Diagnosed With Brugada Syndrome: Results From the FINGER Brugada Syndrome Registry

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

Circulation. 2010;121:635-643; originally published online January 25, 2010;

Table. Patient Characteristics According to Their Clinical Presentation

	Cardiac Arrest Group	Syncope Group	Asymptomatic Group	P
No. of patients	62	313	654	
Index patients, %	98	93	70	<0.001
Male, n (%)	55 (89)	238 (76)	452 (69)	0.01
Age at diagnosis, y	43 (35–54)	46 (37–57)	45 (35–55)	0.19
Family history of SCD, n (%)	6 (10)	63 (20)	195 (30)	<0.001
PR, ms	160 (130–190)	180 (158–200)	171 (160–195)	0.01
QRS, ms	106 (95–120)	105 (93–117)	100 (92–115)	0.19
ST elevation, mm	2 (0.4–3)	2 (1–4)	2 (0.2–3)	0.002
Spontaneous type 1 ECG, n (%)	31 (50)	169 (54)	268 (41)	0.001
EPS performed, n (%)	36 (58)	233 (74)	369 (56)	<0.001
Inducible VT/VF, n (%)	16 (44)	109 (47)	137 (37)	0.06
SCN5A mutations, n (%)	12/49 (24)	53/203 (26)	120/398 (30)	0.92
Follow-up,* mo	44 (26–68)	34 (14–58)	31 (13–53)	0.01
No. of patients with events during follow-up	22	19	10	<0.001
Mean event rate per year, %	7.7	1.9	0.5	



Long-Term Prognosis of Patients Diagnosed With Brugada Syndrome: Results From the FINGER Brugada Syndrome Registry

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

Circulation. 2010;121:635-643; originally published online January 25, 2010;

Taux d'évènement rythmique annuel

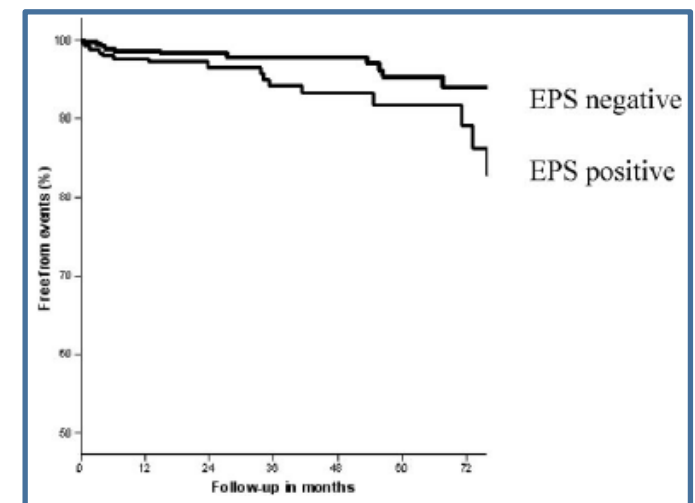
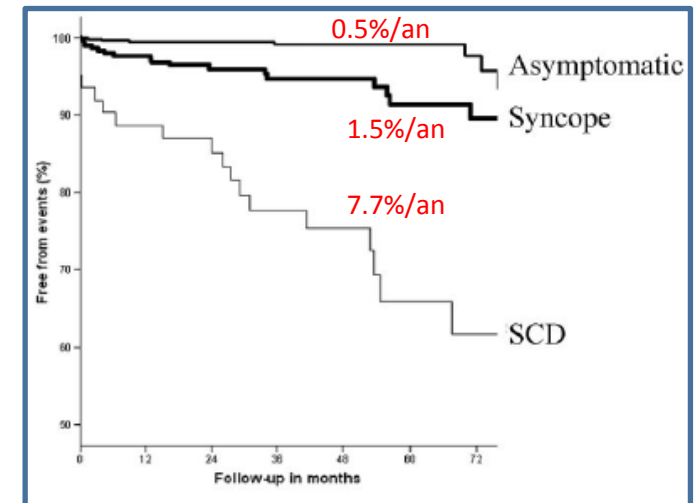


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Mean event rate per year, %	7.7	1.9	0.5	

HRS/EHRA/APHRS 2013

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:
 - a) Who 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.

ACC/AHA/ESC 2006

Class IIa

1. An ICD is reasonable for Brugada syndrome patients with spontaneous ST-segment elevation in V_1 , V_2 , or V_3 who have had syncope with or without mutations demonstrated in the *SCN5A* gene and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)
2. Clinical monitoring for the development of a spontaneous ST-segment elevation pattern is reasonable for the management of patients with ST-segment elevation induced only with provocative pharmacological challenge with or without symptoms. (*Level of Evidence: C*)
3. An ICD is reasonable for Brugada syndrome patients with documented VT that has not resulted in cardiac arrest and who have reasonable expectation of survival with a good functional status for more than 1 y. (*Level of Evidence: C*)
4. Isoproterenol can be useful to treat an electrical storm in the Brugada syndrome. (*Level of Evidence: C*)

HRS/EHRA/APHRs 2013

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 SCD alone.

ACC/AHA/ESC 2006

Class IIb

1. EP testing may be considered for risk stratification in asymptomatic Brugada syndrome patients with spontaneous ST elevation with or without a mutation in the *SCN5A* gene. (*Level of Evidence: C*)
2. Quinidine might be reasonable for the treatment of electrical storm in patients with Brugada syndrome. (*Level of Evidence: C*)

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 Jirasirirojanakorn, Khanchit Likittanasombat, Kiertitjai Bhuripanyo and Tachapong Ngarmukos

Circulation. 2011;123:1270-1279; originally published online March 14, 2011;

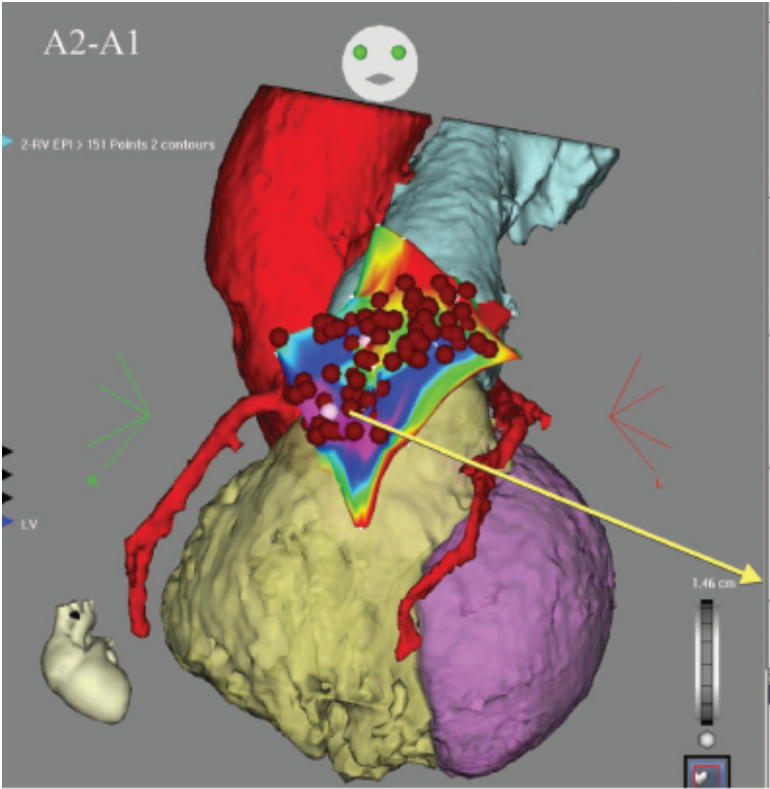
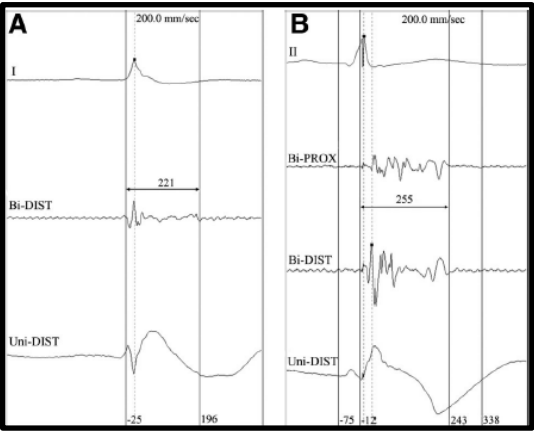
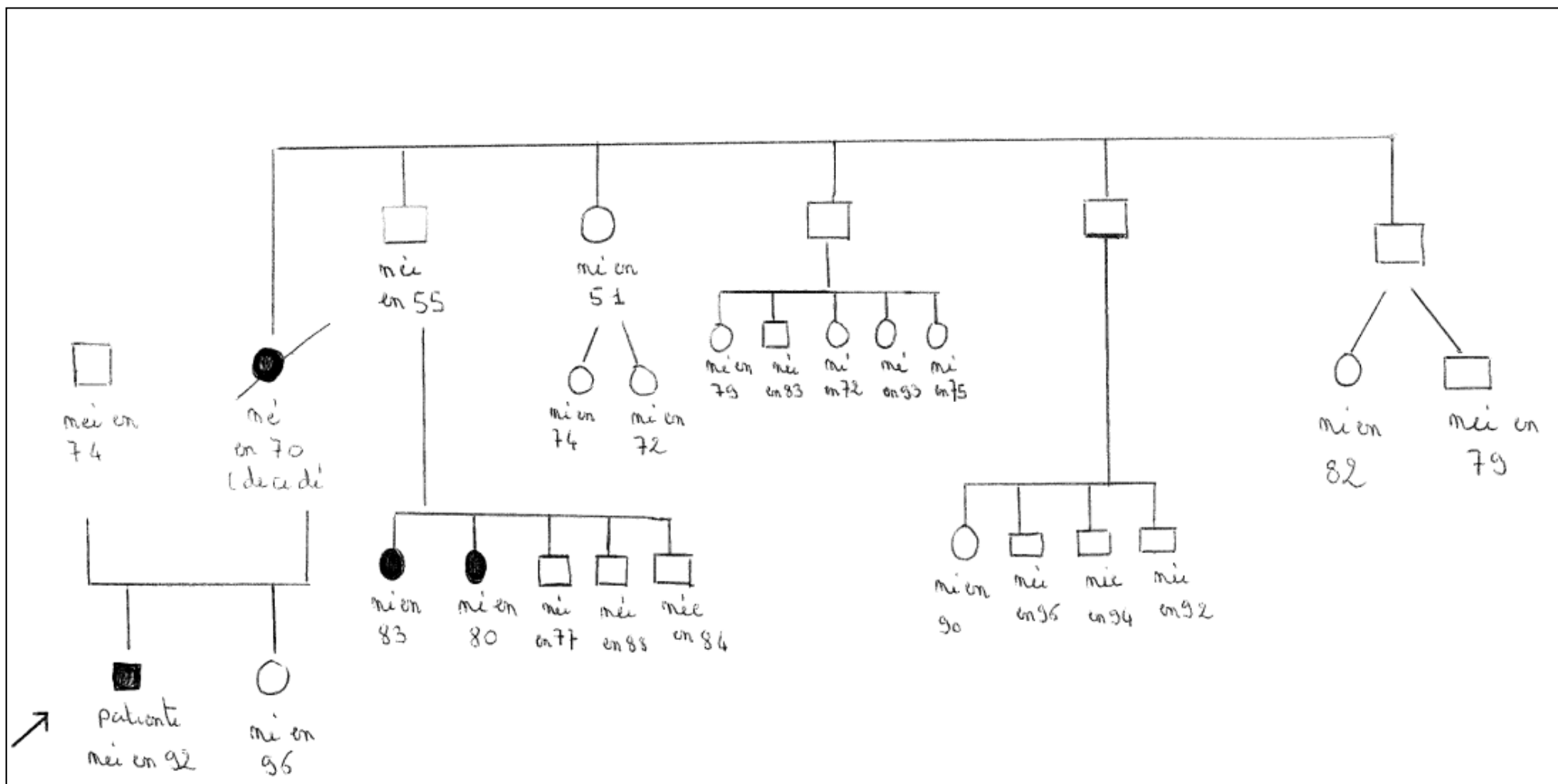


Table 1. Clinical Characteristics of the Study Patients

Patient	Age	Sex	BrS-ECG	VF Episodes per Month, n	Initial Symptoms	BrS ECG After, Yes/No	Inducible Before	Inducible After	Time from ICD to First Episodes, mo	Follow-Up Period, mo
1	29	M	Yes	5	CA	Yes	Single	Noninducible	4	33
2	38	M	Yes/Aj	3	CA	No	Single	Triple	23	24
3	32	M	Yes	4	CA	No	Single	Noninducible	5	20
4	24	M	Yes	4	CA	No	Double	Triple	36	20
5	52	M	Yes/Aj	6	CA	No	Double	Noninducible	83	20
6	45	M	Yes	2	CA	No	Double	Noninducible	7	17
7	35	M	Yes	5	CA	No	Double	Noninducible	12	20
8	53	M	Yes	2	CA	No	Triple	Noninducible	60	12
9	47	M	Yes	6	CA	No	Double	Noninducible	16	12
Median	38			4					16	20





BIENVENUE DANS LE CENTRE DE REFERENCE DES MALADIES CARDIAQUES HEREDITAIRES



Présentation Espace patient et familles Espace médecin Comment nous contacter ? Adresses utiles Galeries

Accueil ► Espace médecin ► Aspects cardiologies ► Syndrome de Brugada

Recherche... OK

☑ Syndrome de Brugada

Navigation

☑ Aspects cardiologies

- Cardiomyopathie Dilatée (CMD)
- Cardiomyopathie Hypertrophique (CMH)
- Dysplasie Ventriculaire Droite Arythmogène (DVDA)
- Le syndrome du QT Long Congénital (QTL)
- Syndrome de Brugada
- Tachycardie ventriculaire catécholergique (TVC)

☑ Aspects génétiques

- Le conseil génétique et le test génétique

☑ Agenda

- "3e Journée nationale des maladies cardiaques héréditaires, le 09 février 2013"
- 05/04/2014 Journée des maladies cardiaques

Fiche de Synthèse des données scientifiques utiles au conseil génétique :

Le Syndrome de Brugada Société Française de Génétique Humaine 1. INTRODUCTION C'est en 1992 que les frères P. et J. Brugada ont décrit une nouvelle entité clinique associant un bloc de branche droit avec élévation du segment ST sur l'électrocardiogramme (dérivations V1 à V3) et un risque élevé de mort subite, en l'absence d'anomalies cardiaques morphologiques (Brugada et al., 1992). Depuis, la maladie est appelée communément « syndrome de Brugada » (OMIM 601144). (...) [Lire la suite »](#)

Fiche sports :

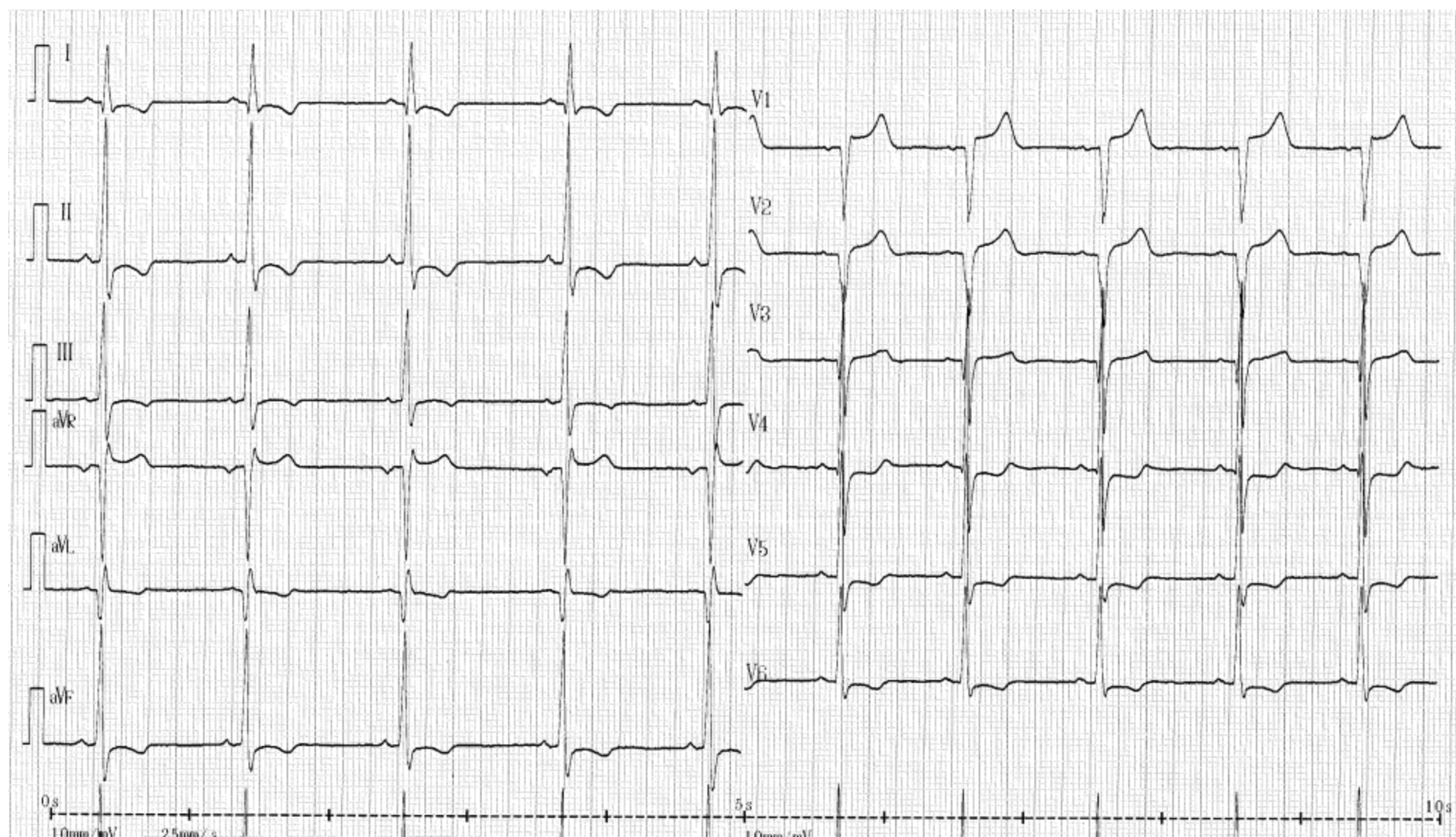
Recommandations pour la participation aux activités sportives de loisirs pour les patients atteints du syndrome de Brugada Le sport en compétition est habituellement interdit. Les recommandations qui suivent concernent l'activité de loisir et sont données à titre indicatif et doivent être adaptées au cas par cas (selon les symptômes, les résultats du bilan cardiologique précis, l'effet contrôlé du traitement médicamenteux), en accord avec le cardiologue du patient. D'une f(...) [Lire la suite »](#)

Liste médicaments :

Liste de médicaments contre-indiqués en cas de Syndrome de Brugada La liste des médicaments suivants peut parfois être adaptée à la situation de chaque patient, et doit dans tous les cas être discutée avec le cardiologue traitant. I - Les antiarythmiques Bloqueurs des canaux sodiques Antiarythmiques de classe 1C : flécaïnide, propafénone, cibenzoline Antiarythmiques de classe 1A : disopyramide Les inhibiteurs calciques : vérapamil Les bêta-bloquants II - Les antiangineux : (...) [Lire la suite »](#)

Observation 3

- Mr O... 29 ans
- Asymptomatique
- CMH connue depuis l'adolescence
- Adressé pour évaluation du pronostic rythmique



- Conduite à tenir
 - Diagnostique
 - Thérapeutique

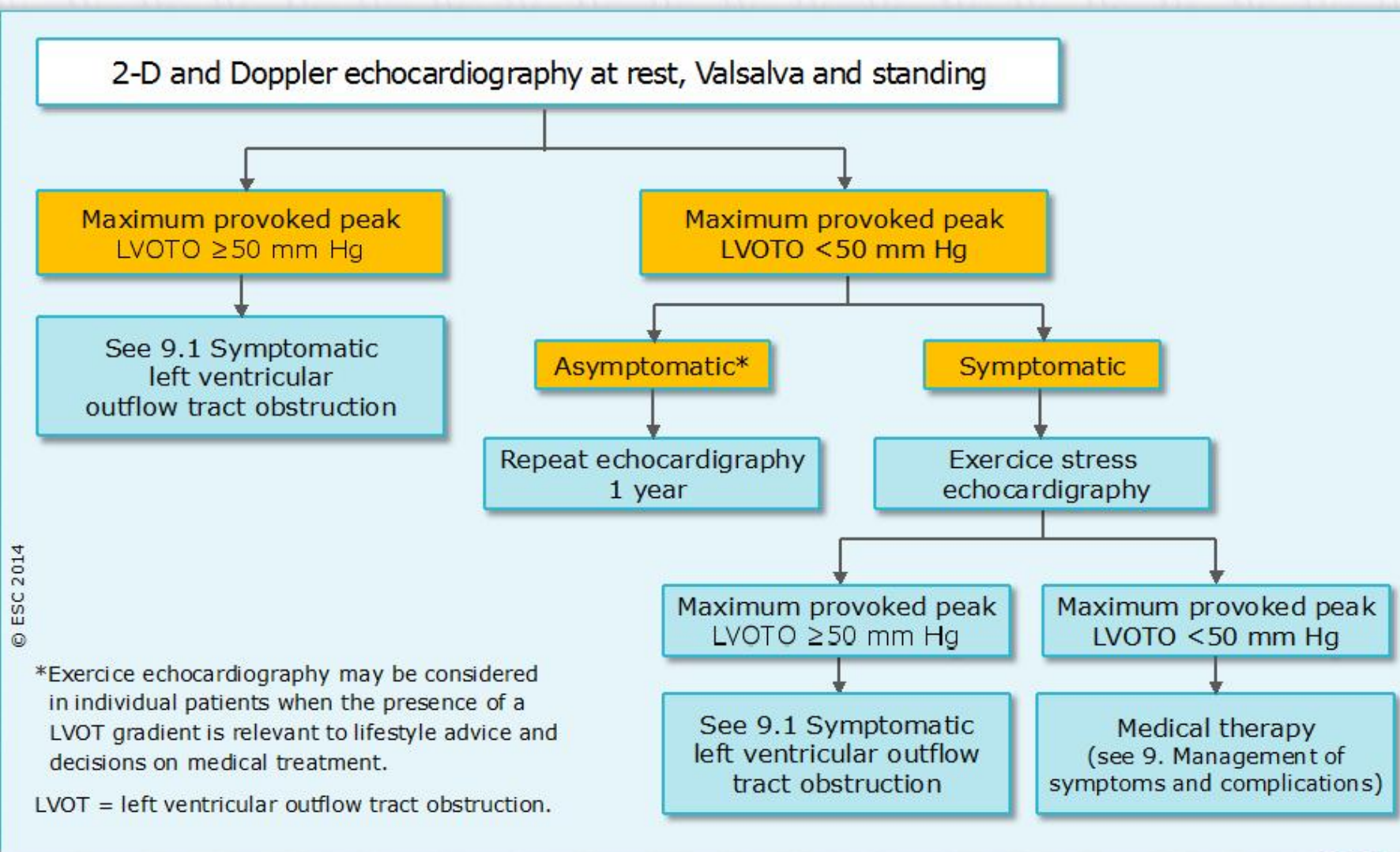
Electrocardiography

Recommendations	Class	Level
Standard 12-lead electrocardiography is recommended in patients with suspected hypertrophic cardiomyopathy to aid diagnosis and provide clues to underlying aetiology.	I	B
48-hour ambulatory ECG monitoring is recommended in patients at their initial clinical assessment to detect atrial and ventricular arrhythmia.	I	B

Transthoracic echocardiography evaluation in hypertrophic cardiomyopathy

Recommendations	Class	Level
In all patients with HCM at initial evaluation, transthoracic 2-D and Doppler echocardiography are recommended, at rest and during Valsalva manoeuvre in the sitting and semi-supine positions—and then on standing if no gradient is provoked.	I	B
Measurement of maximum diastolic wall thickness is recommended, using 2-D short-axis views in all LV segments, from base to apex.	I	C
A comprehensive evaluation of LV diastolic function is recommended, including pulsed Doppler of mitral valve inflow, tissue Doppler velocities at the mitral annulus, pulmonary vein flow velocities, pulmonary artery systolic pressure, and measurement of LA size and volume.	I	C
In <i>symptomatic</i> patients with a resting or provoked peak instantaneous LV outflow tract gradient <50 mm Hg, 2-D and Doppler echocardiography <i>during exercise</i> in the standing, sitting or semi-supine position is recommended to detect provokable LVOTO and exercise induced mitral regurgitation.	I	B

Protocol for the assessment and treatment of left ventricular outflow tract obstruction



Prevention of sudden cardiac death

Recommendations	Class	Level
Avoidance of competitive sports is recommended in patients with HCM.	I	C
ICD implantation is recommended in patients who have survived a cardiac arrest due to VT or VF, or who have spontaneous sustained VT causing syncope or haemodynamic compromise, and have a life expectancy of >1 year.	I	B
HCM Risk-SCD is recommended as a method of estimating risk of sudden death at 5 years in patients aged ≥ 16 years without a history of resuscitated VT/VF or spontaneous sustained VT causing syncope or haemodynamic compromise.	I	B
It is recommended that the 5-year risk of SCD be assessed at first evaluation and re-evaluated at 1–2 yearly intervals or whenever there is a change in clinical status.	I	B
ICD implantation should be considered in patients with an estimated 5-year risk of sudden death of $\geq 6\%$ and a life expectancy of >1 year, following detailed clinical assessment that takes into account the lifelong risk of complications and the impact of an ICD on lifestyle, socio-economic status and psychological health.	IIa	B

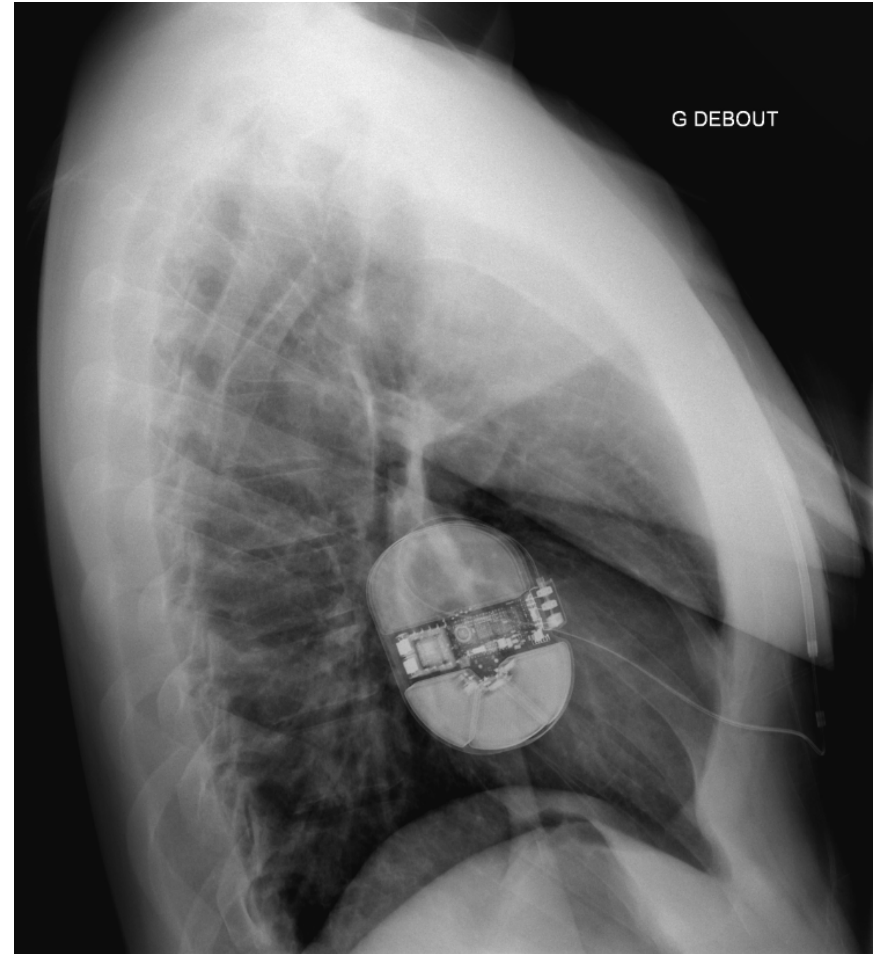
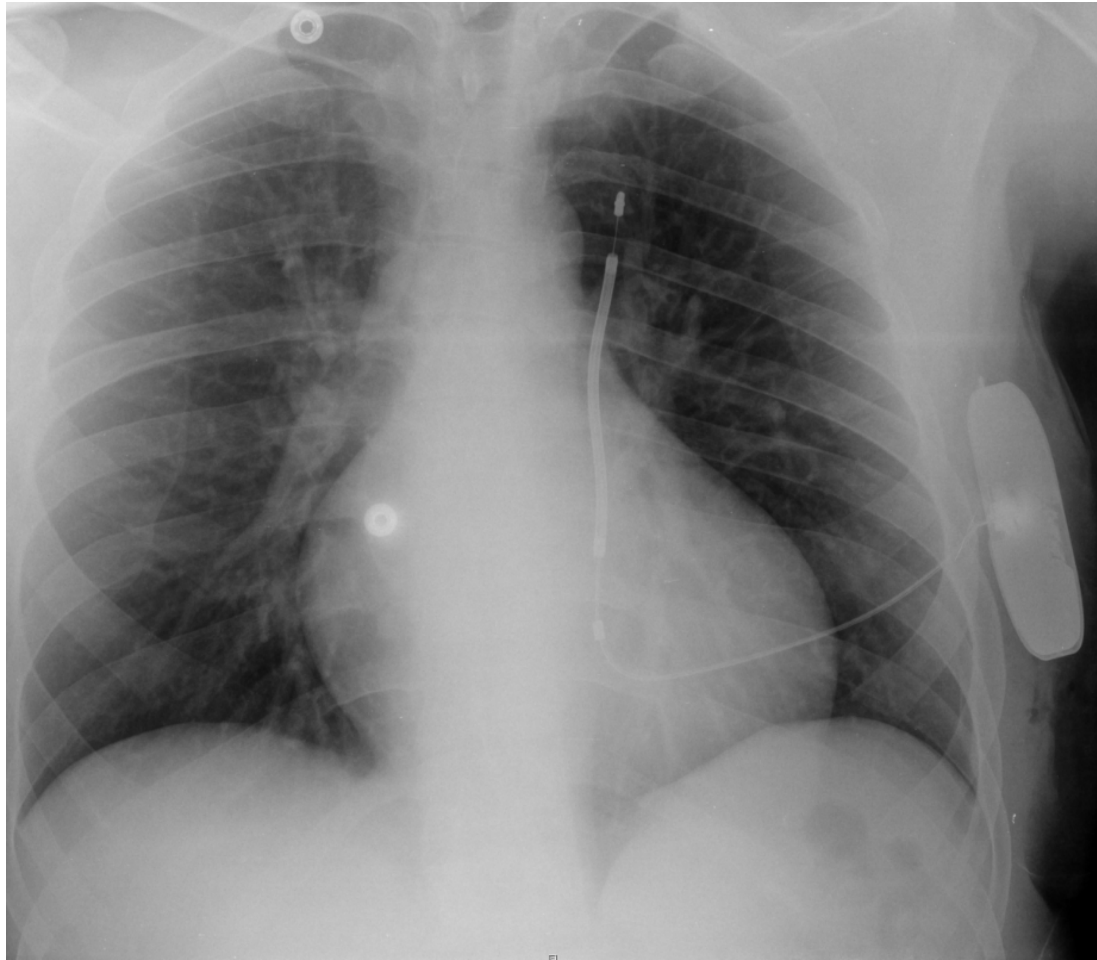
HCM Risk-SCD Calculator



Age	28	Age at evaluation	
Years			
Maximum LV wall thickness	25 mm	Transthoracic Echocardiogram measurement	
Left atrial size	41 mm	Left atrial diameter determined by 2D echocardiogram parasternal long axis plane evaluation	
Max LVOT gradient	5 mmHg	The maximum LV outflow gradient determined at rest and with provocation (irrespective of medical treatment) using parasternal long axis plane evaluation	
Family History of SCD	☒ No ☐ Yes	History of sudden cardiac death or first degree relatives with SCD in a first degree relative with confirmed HCM (post or ante-mortem diagnosis)	
Non-sustained VT	☐ No ☒ Yes	3 consecutive ventricular tachycardia (120 beats per minute or more) on Holter monitor (duration 24 hours) at or prior to evaluation.	
Unexplained syncope	☐ No ☒ Yes	History of unexplained syncope prior to evaluation.	

Risk of SCD at 5 years (%)	6.75
ESC recommendation	ICD should be considered

Reset



Genetic counselling

Recommendations	Class	Level
Genetic counselling is recommended for all patients with HCM when their disease cannot be explained solely by a non-genetic cause, whether or not clinical or genetic testing will be used to screen family members.	I	B
Genetic counselling should be performed by professionals trained for this specific task working within a multidisciplinary specialist team.	IIa	C

Diagnostic génétique des Cardiomyopathies

Recherche de mutation dans le gène MYBPC3 (Protéine C cardiaque)

Famille N°2011
Prélèvement N°cmh8041

Méthodes:

PCR-Séquençage direct

Recherche directe d'une mutation connue

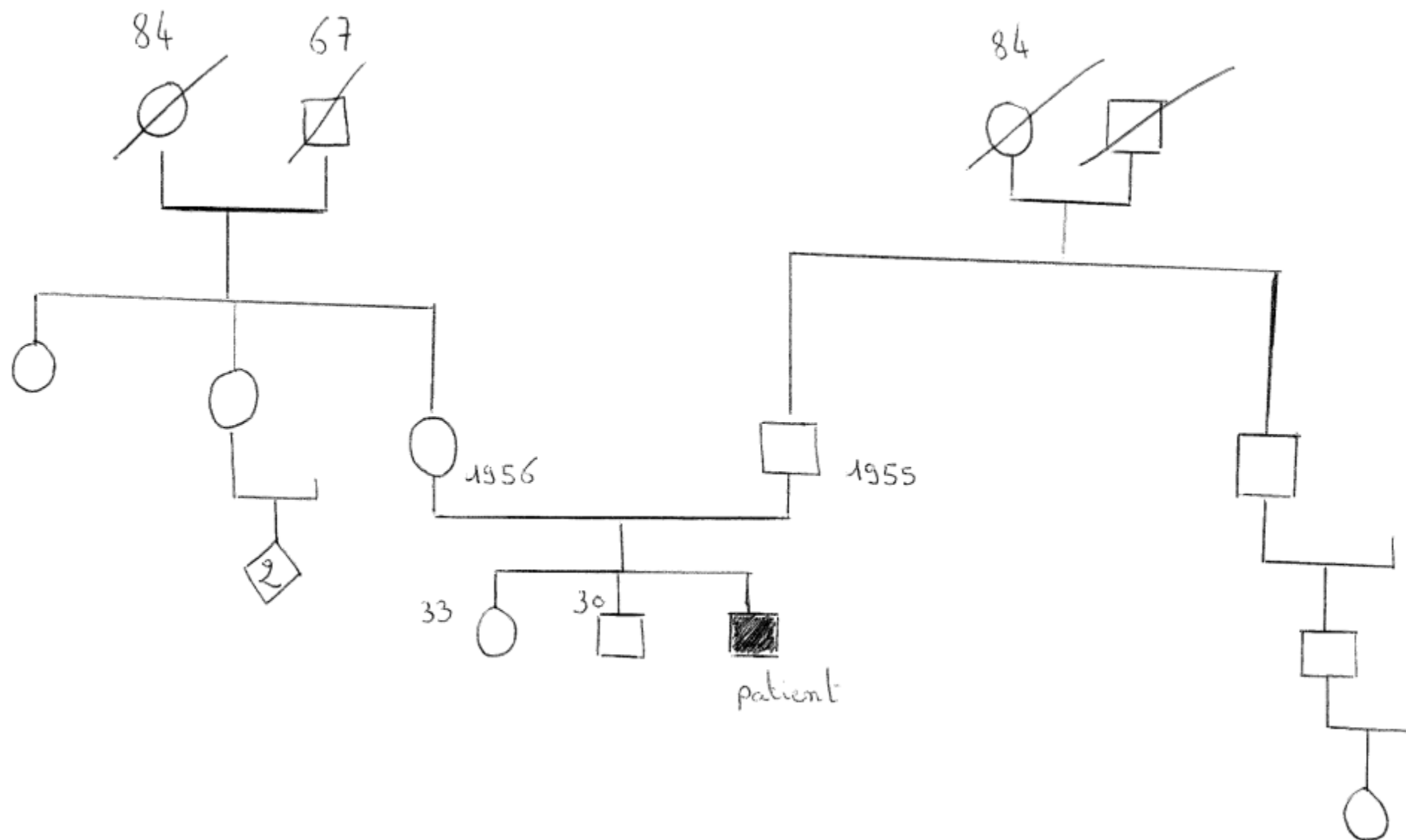
Nature de la mutation: Recherche de la délétion présente dans l'exon 13:
c.1174del.(p.Ala392Leufs*14).

Résultat : Présence de la mutation à l'état hétérozygote.

Genetic and clinical testing of adult relatives

Recommendations	Class	Level
Cascade genetic screening, after pre-test counselling, is recommended in first-degree adult relatives of patients with a definite disease-causing mutation.	I	B
Clinical evaluation, employing ECG and echocardiography and long-term follow-up, is recommended in first-degree relatives who have the same definite disease-causing mutation as the proband.	I	C
First-degree relatives who do not have the same definite disease-causing mutation as the proband should be discharged from further follow-up but advised to seek re-assessment if they develop symptoms or when new clinically relevant data emerge in the family.	IIa	B
When no definite genetic mutation is identified in the proband or genetic testing is not performed, clinical evaluation with ECG and echocardiography should be considered in first-degree adult relatives and repeated every 2-5 years (or 6-12 monthly if non-diagnostic abnormalities are present).	IIa	C

Proband = usually the first family member to be diagnosed with the condition.





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Recherche... OK

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☑ Cardiomyopathie Hypertrophique (CMH)

Protocole national de diagnostic et de soins :

PNDS sur cardiomyopathie hypertrophique.pdf(...) [Lire la suite »](#)

Liste des actes et prestations :

liste des actes et prestations sur cardiomyopathie hypertrophique.pdf(...) [Lire la suite »](#)

Fiche sports :

Recommandations pour la participation aux activités sportives de loisirs pour les patients atteints de Cardiomyopathie Hypertrophique Le sport en compétition est formellement interdit. Les recommandations qui suivent concernent l'activité de loisir et sont données à titre indicatif et doivent être adaptées au cas par cas (selon les symptômes, les résultats du bilan cardiologique précis, l'effet contrôlé du traitement médicamenteux), en accord avec le cardiologue du patient. D&S (...) [Lire la suite »](#)

Argumentaire scientifique :

Agumentaire PNDS CMH.pdf(...) [Lire la suite »](#)

Il s'agit d'un homme d'une trentaine d'années décédé subitement vers 23-24h, au repos, alors qu'il venait de dire à son épouse qu'il allait la rejoindre pour se coucher. Elle l'a entendu râler et a entamé la réanimation (elle est médecin) mais, malheureusement, l'anoxie cérébrale et une défaillance multiviscérale ont amené au décès après quelques jours en réanimation à la Timone.

Ses ECG sont joint, datés.

Son épouse pose évidemment le problème étiologique pour lui et leurs 2 enfants jeunes.

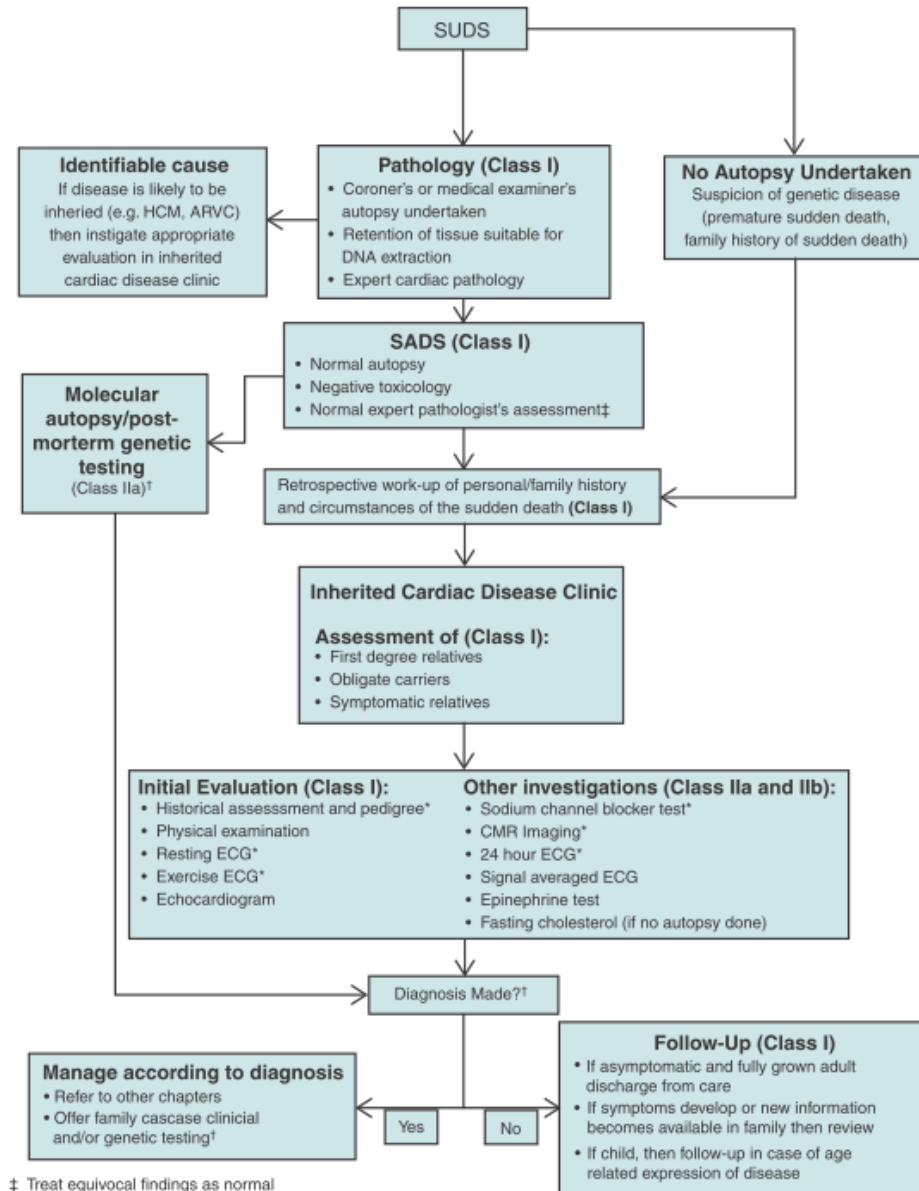
Il a été prélevé et les tubes sont partis chez V Fressart (initiative de la réa polyvalente, il n'était pas dans mon service), sans résultat pour l'instant.

Rien dans la famille, frère et parents vus, avec ECG normal

Enfants : RAS

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

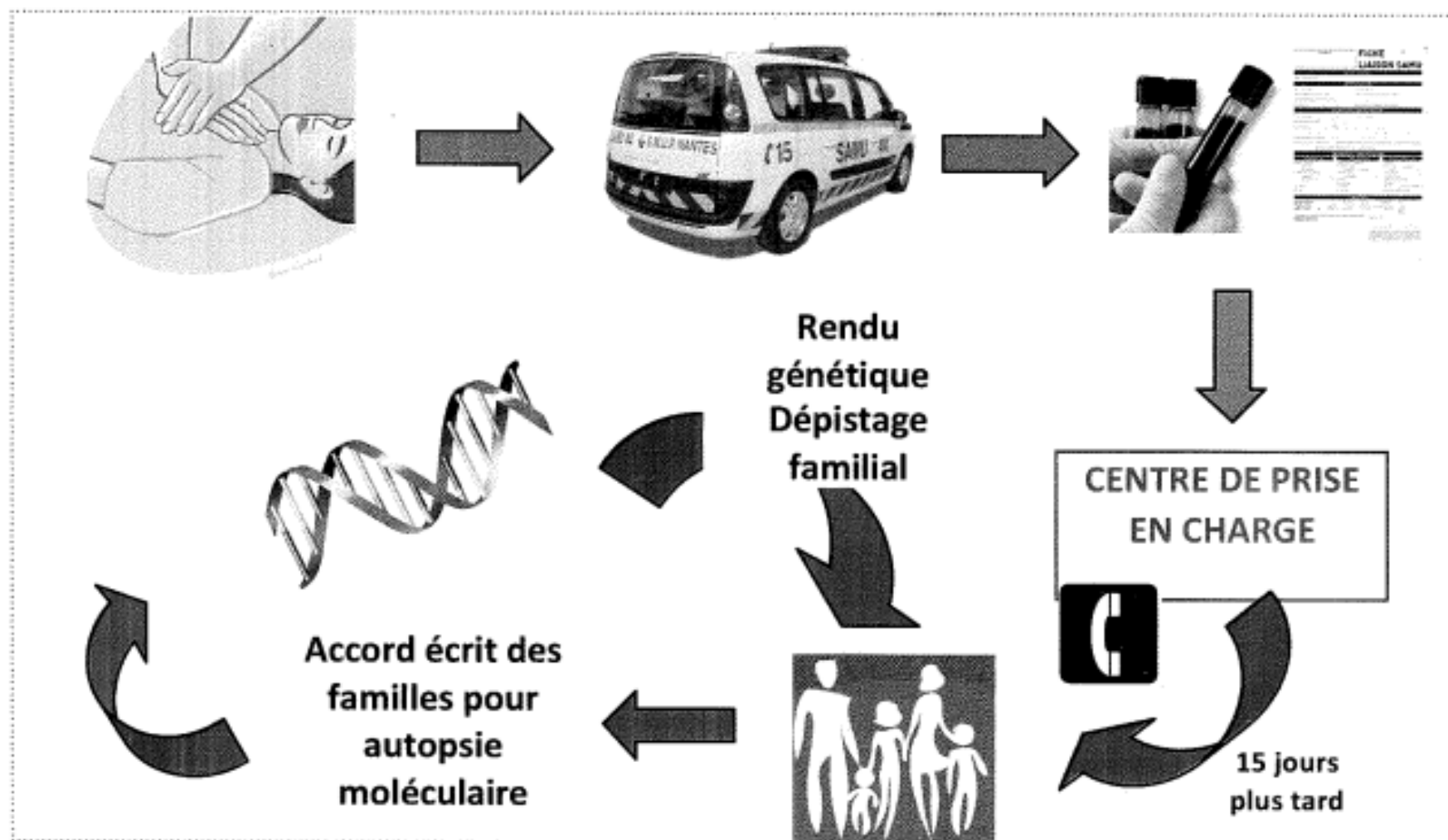
Silvia G. Priori, (HRS Chairperson)¹, Arthur A. Wilde, (EHRA Chairperson)², Minoru Horie, (APHS Chairperson)³, Yongkeun Cho, (APHS Chairperson)⁴, Elijah R. Behr⁵, Charles Berul⁶, Nico Blom^{7a}, Josep Brugada⁸, Chern-En Chiang⁹, Heikki Huikuri¹⁰, Prince Kannankeril^{11†}, Andrew Krahn¹², Antoine Leenhardt¹³, Arthur Moss¹⁴, Peter J. Schwartz¹⁵, Wataru Shimizu¹⁶, Gordon Tomaselli^{17†}, Cynthia Tracy¹⁸



‡ Treat equivocal findings as normal

† Refer to HRS/EHRA Genetic Testing recommendations

* Investigations with greatest yield



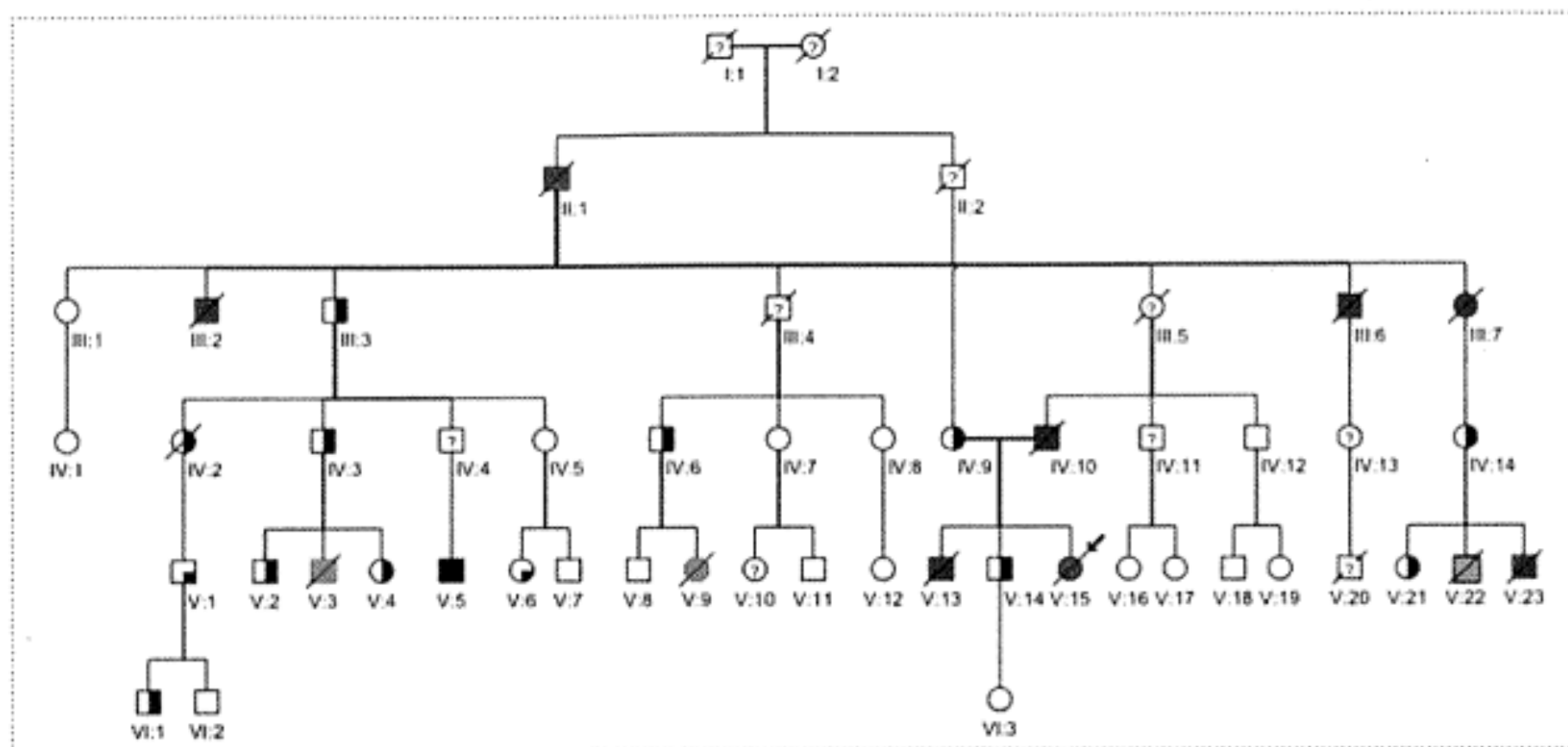
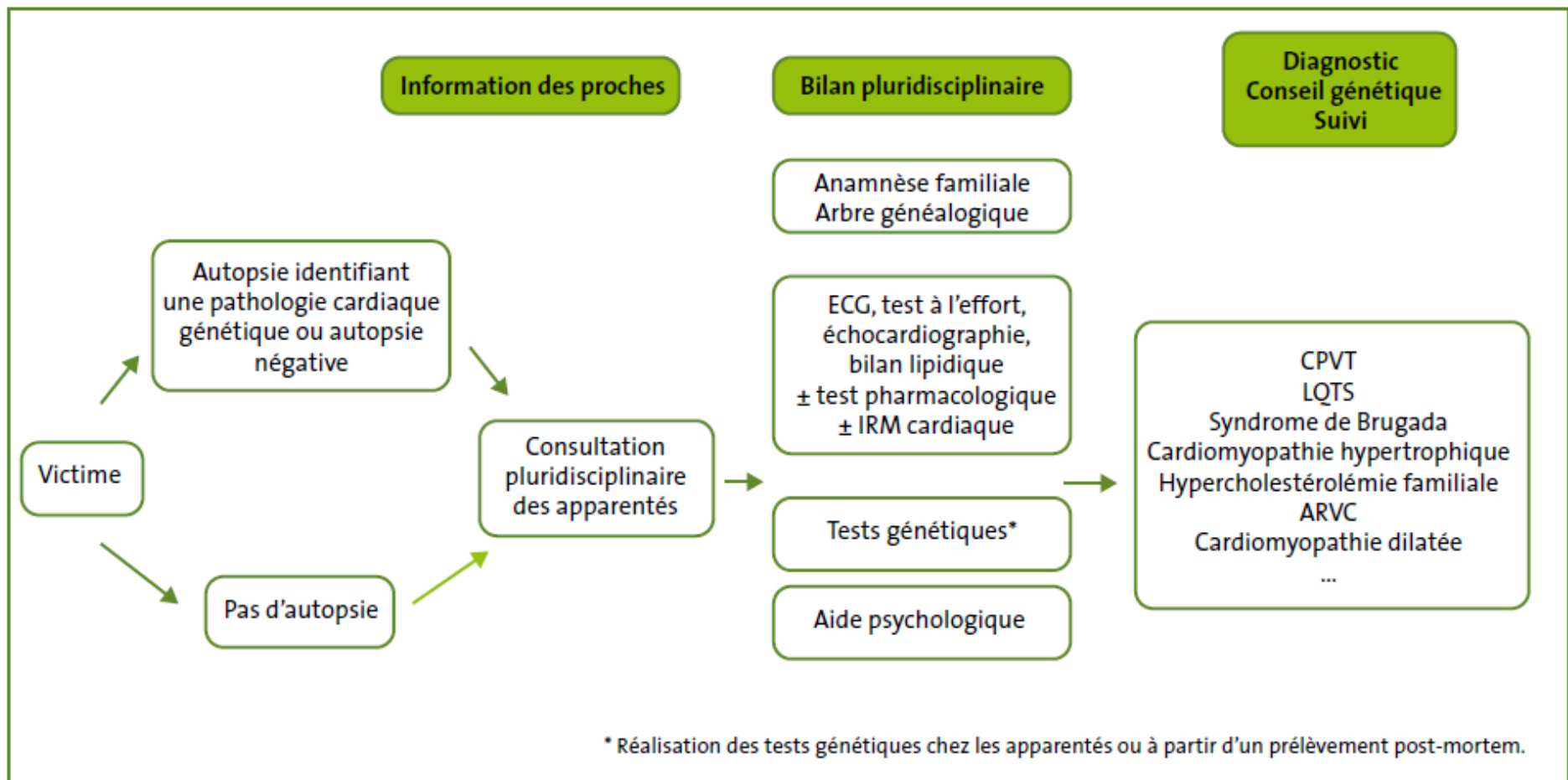


Figure 1 - Famille avec 11 cas de mort subite dans laquelle il a été finalement possible d'identifier une repolarisation précoce maligne. Les sujets en vert, en rouge et en bleu sont décédés brutalement jeunes.



Dépistage génétique

Cas index:

Post mortem

Expression clinique de la pathologie (phénotype)

Dépistage familial

Si identification d'une mutation chez le cas index

Dépistage génétique

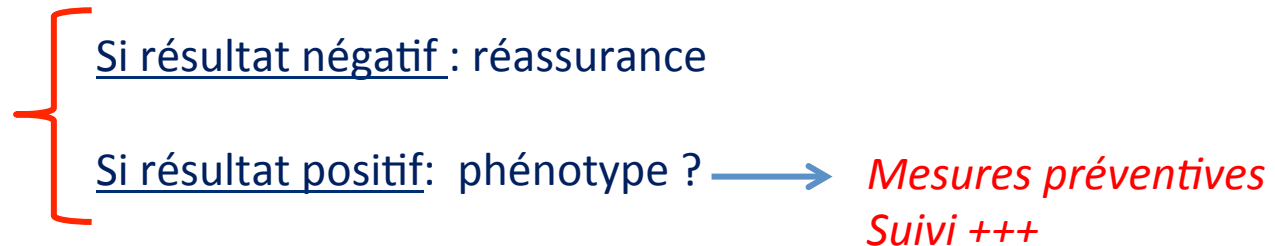
Cas index:

Post mortem

Expression clinique de la pathologie (phénotype)

Dépistage familial

Si identification d'une mutation chez le cas index



CONCLUSION

Penser aux troubles du rythme héréditaire devant toute mort subite inexpliquée du sujet jeune

Intérêt préventif des récidives au sein du même famille

Prise en charge pluridisciplinaire généticien-clinicien

Problématique: Corrélation génotype-phénotype
(maladie sans mutation/ mutation sans maladie)

Accompagnement et information des familles