LB-734-01 –

Feasibility and Safety of Catheter-Based Cardioneural Ablation: Results from the Multicenter US CNA Registry

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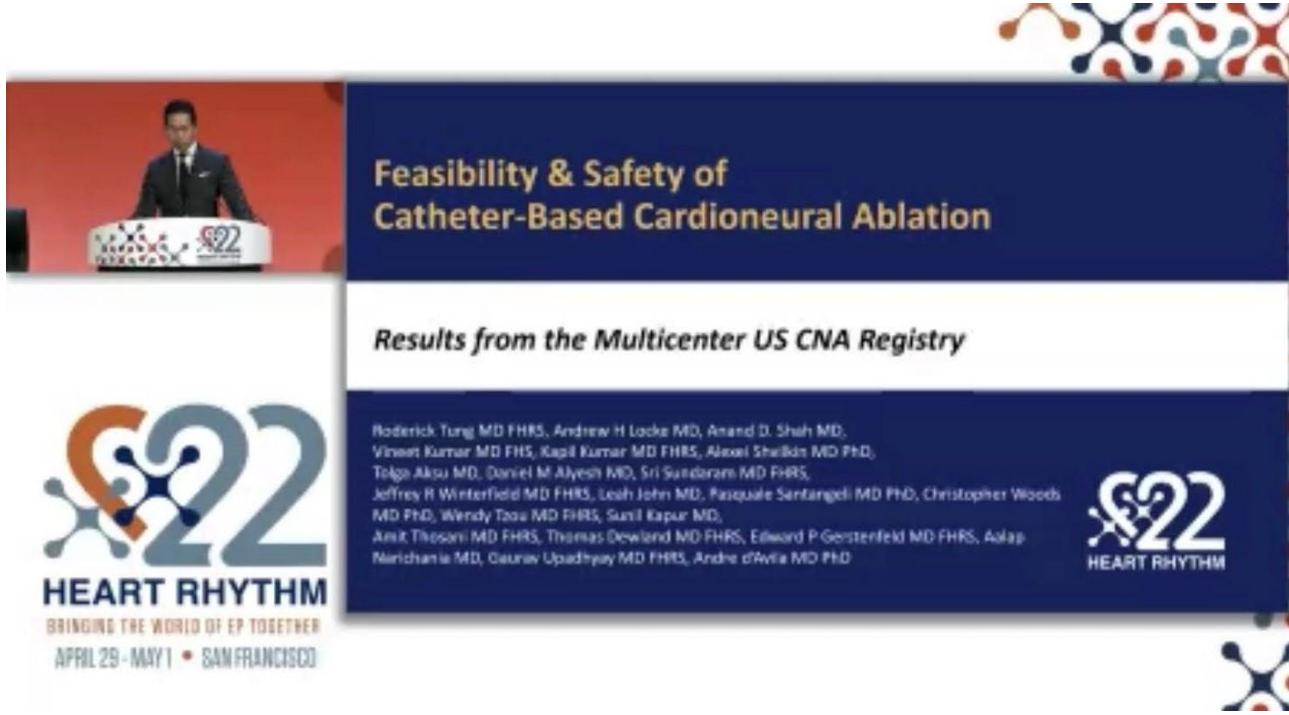


Objectifs

- Efficacité et sécurité de la cardio-neuro ablation
- Définir les procédures réalisées et les critères de succès utilisés
- Hypothèses:
  - faible taux de complications
  - réduit l’incidences des événements

Méthodes

- Registre rétrospectif multicentrique des cas consécutifs dans 13 centres US entre 2015 et 2022

- Critères d'inclusion:

> 18 ans ; CNA car échec thérapeutique ou « compassionnel »

- Bradycardies sinusales (66%)
- Blocs AV (4%)
- Syncopes vagales (30%)
  - tilt test, holter, ILR avec corrélation électro-clinique

Résultats

- **76 procédures** dans 13 centres

- **63% des procédures associées à une autre ablation**:
  - 86 % FA ou flutter (gauche ?)
  - 7% Kent
  - 7% SVT

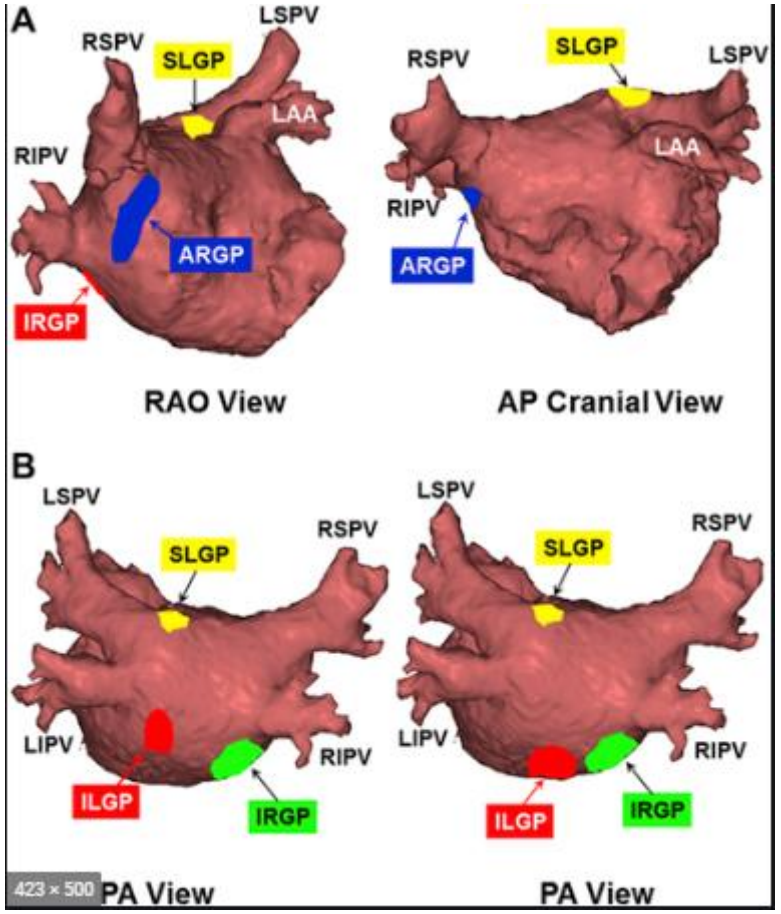
- 47±17 ans ; 51%

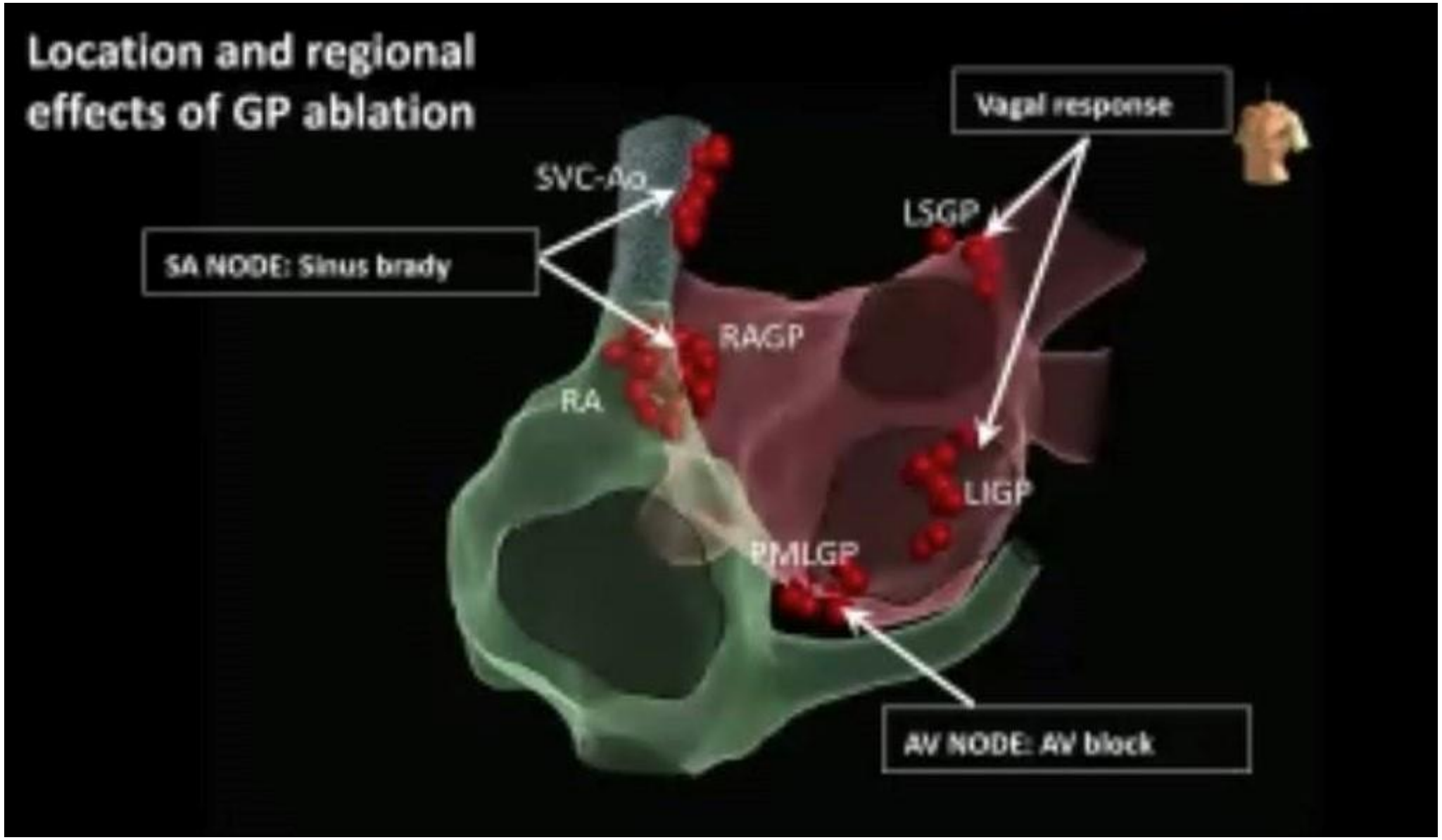
- Diagnostic sur: ♀
  - ILR 26%
  - tilt test 11%
  - holter 63%

Localisation des GPs

- 4 GPs péri atriaux
  - Antérieur droit
  - Inférieur droit
  - Supérieur gauche
  - Inférieur gauche

- Première étape : les localiser




Location and regional effects of GP ablation
Vagal response
SVC-Ao
LSGP
SA NODE: Sinus brady
RAGP
RA
LIGP
PMLGP
AV NODE: AV block

Anatomique

Approche simple

Probabiliste

Insuffisante

Variabilité de la position des GPs

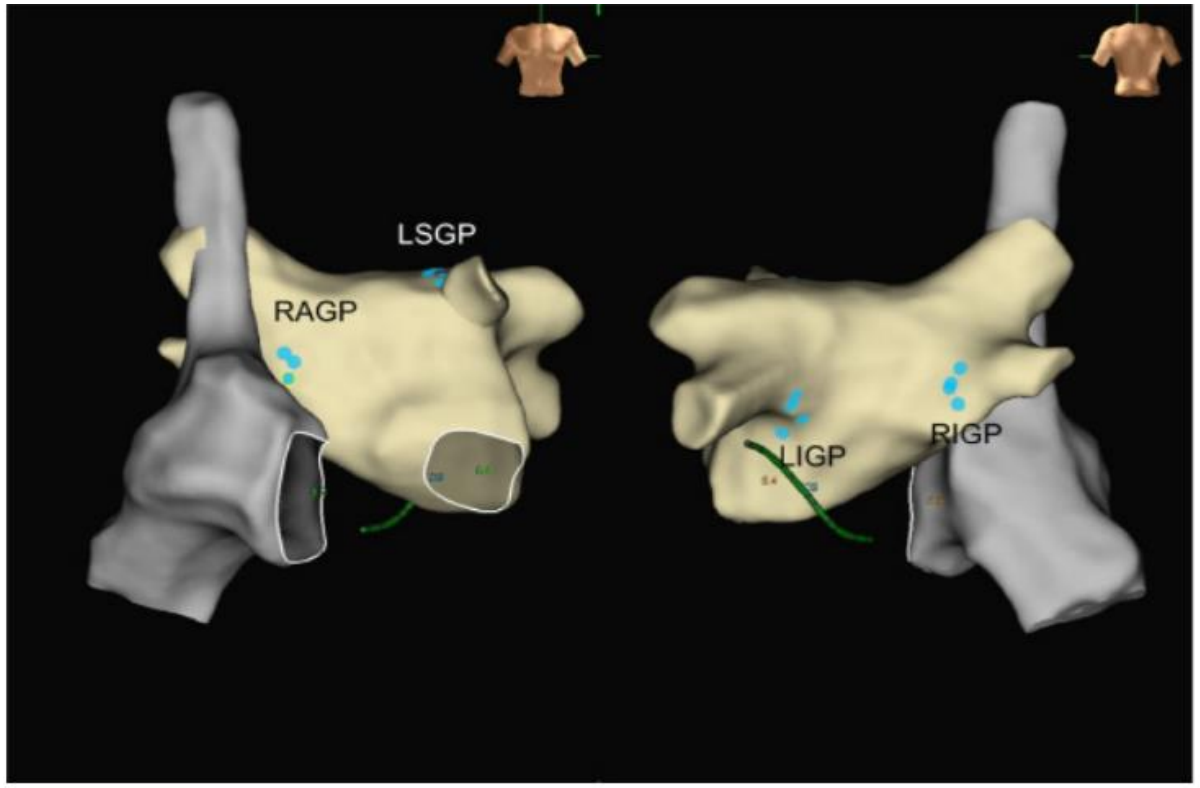


Figure 1: The 3-dimensional endocardial surface of the left atrium, right atrium, and locations of ganglionated plexi.

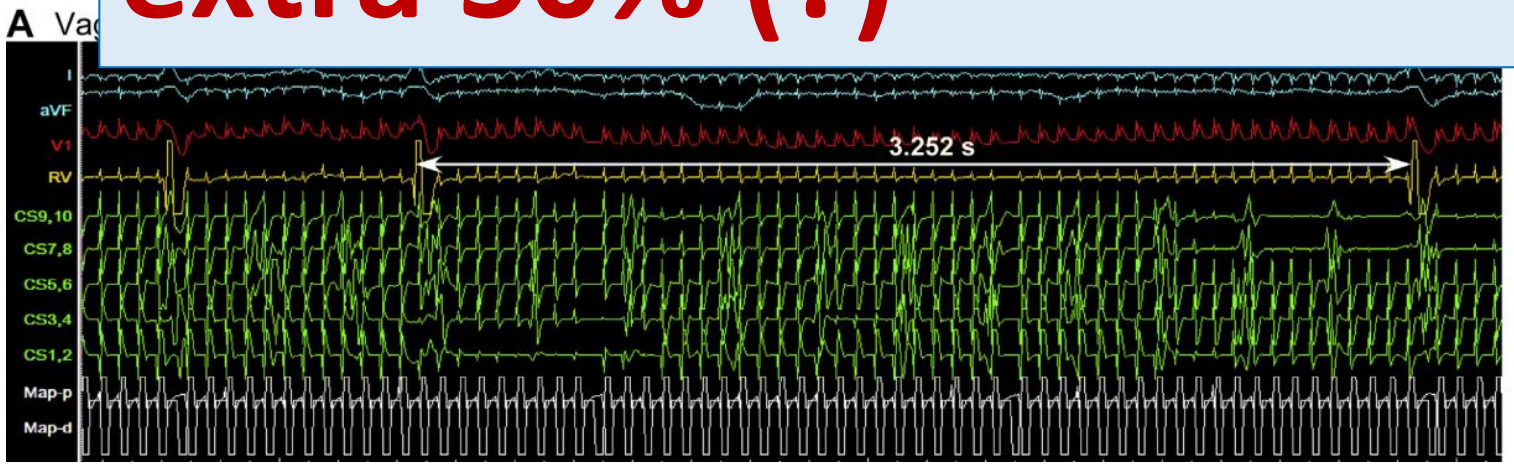
Stimulation à haute fréquence (HFS)

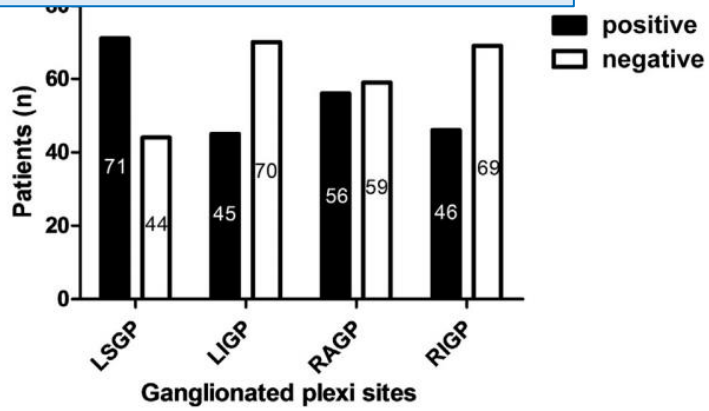
Positionnement en regard des zones anatomiques

HFS = 20 Hz ; 10-20 V/5msec ; 2-5 secondes

R

- **42 %: 81% en intra-cardiaque, extra 50% (?)**





Electrophysiologique

- Analyse du signal bipolaire
- Filtres spécifiques 200-500 Hz
- Défilement 200 mm/s

- Analyse de l'amplitude et du nombre de déflexions
- **low-amplitude fractionated electrogram,**

≥ 4 déflexions ; ≥ 0.7 mV;

- **high-amplitude fractionated electrogram,**

≥ 4 déflexions ; ≥ 0.7 mV;

- Avantage : pas de materiel spécifique – filtres spécifiques

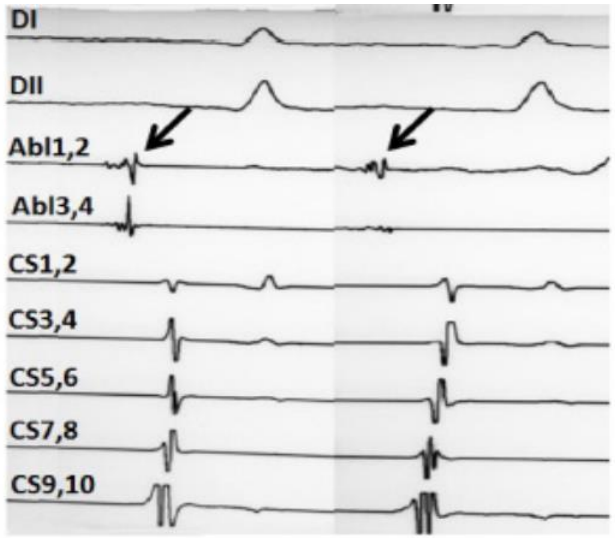
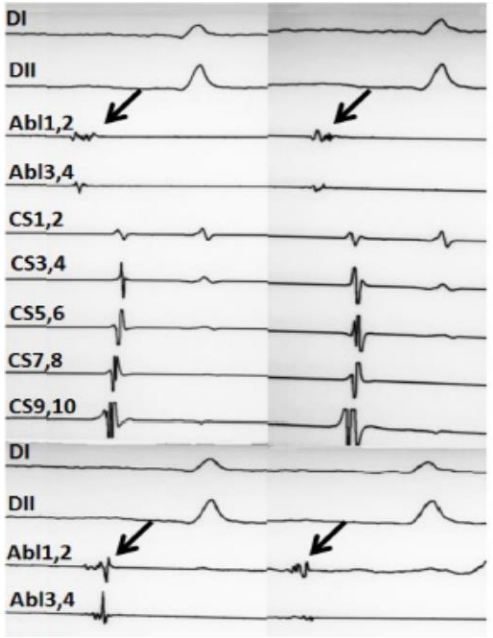
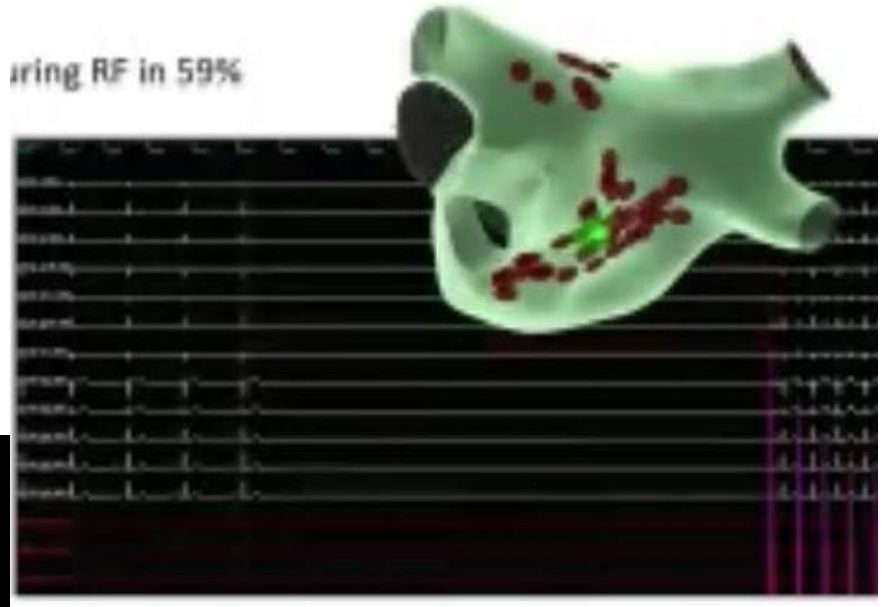
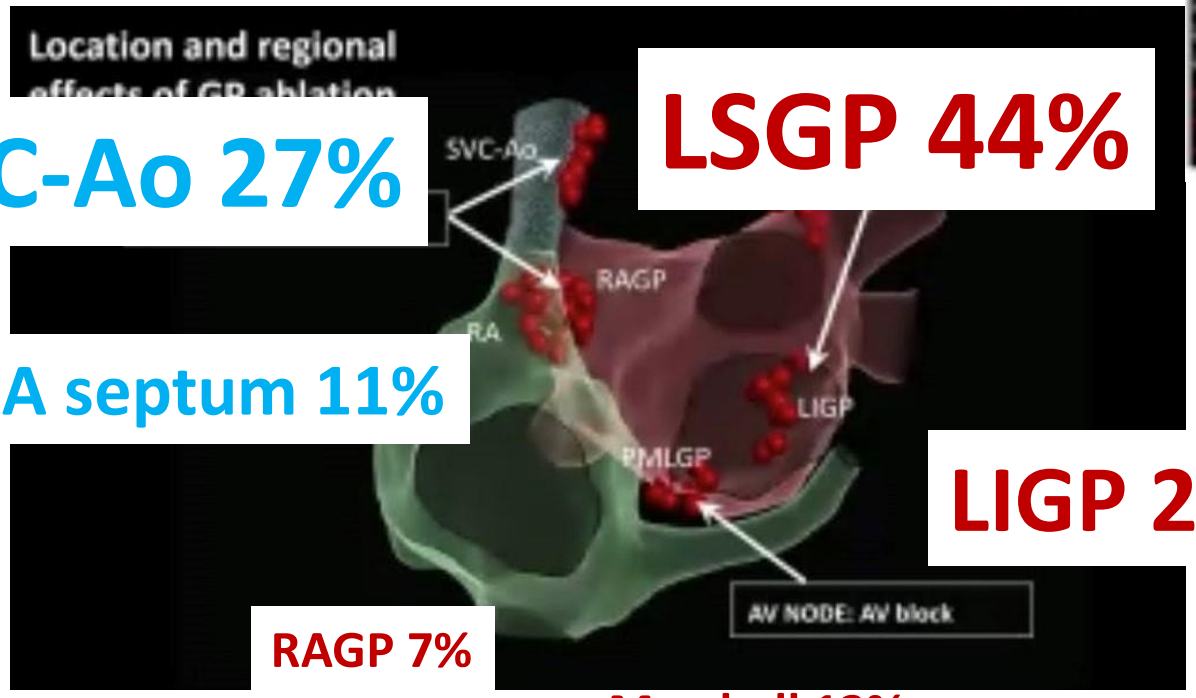


Figure 3: Low-amplitude and high-amplitude fractionated electrograms are seen during electroanatomic mapping guided cardioneuroablation



Résultats: réponse vagale





SVC-Ao 27%

LSGP 44%

RA septum 11%

LIGP 24%

RAGP 7%

RIGP 2%

Marshall 13%

PMLV 9%

Results- *Sympathetic response*

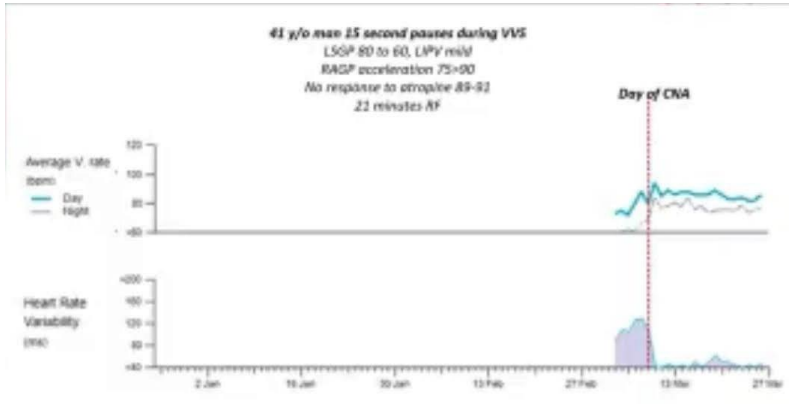
- Sympathetic response (>5 bpm) during RF in 70%
  - **SVC-Ao 58%**
  - **RAGP 49%**
  - LSGP 19%
  - LIGP 8%
  - RA septum 6%
  - PMLV 2%
- Acute procedural endpoint
  - RR interval 1047 ms to 775ms, ***p<0.001***
  - AH interval 102 ms to 95 ms, *p=NS*, HV 46 to 44 ms, *p=NS*

Résultats

- **temps RF moyen: 612 s**

- **complications**:
  - 1 tamponnade
  - 2 rythmes jonctionnels
  - parle de 4 dysfonctions sinusales dans les réponses aux questions

- à 8,5 mois
  - 82% sans syncope
  - 5 reprises
  - médiane des épisodes de 6 à 0 p<0,001



En pratique

Modalités de la procédure

Comment localiser les GPs

Comment les ablater

Réaliser une dénervation partielle ou complète

Comment les ablater

Modalités d’ablation variables selon les équipes

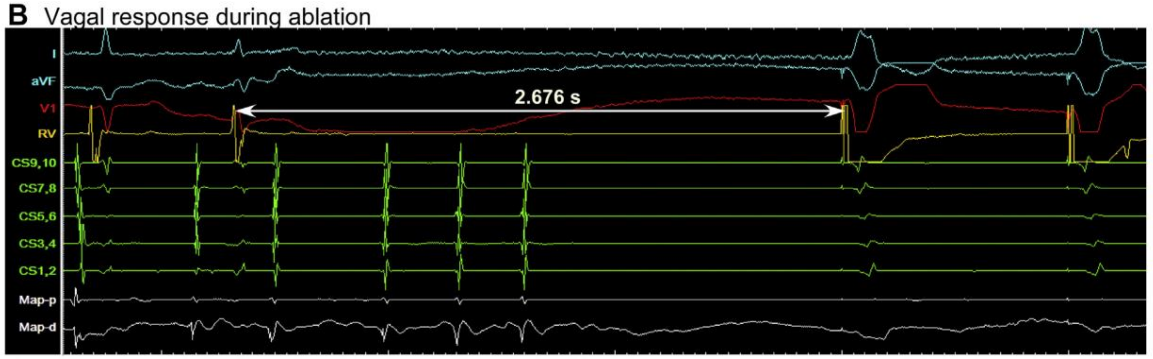
Pachon : 4mm, non irrigué, contrôle température ; 30W/60°C

Feng Hu : non irrigué, 60W/60°C

Aksu : irrigué, 35W, 43°C

Debruyne : irrigué, 40W, force >8g

Comment les ablater



Durant le tir

Réponse la plus courante :
Asystole – BAV – Augmentation du RR
Surtout pour LSGP

Réponse vagale induite dans les 10 sec → poursuite pdt 30 sec

Réponse opposée pour RAGP (tachycardie)

Endpoint de l’ablation

- Elimination de la réponse vagale si HFS positive avant tirs
- Elimination des potentiels fragmentés et élimination de la réponse vagale durant le tir (Aksu)

Accélération de la fréquence cardiaque (75% du RR de début de procédure) si syncope vasovagale avec asystole

Dénervation complète ou partielle ?

- Dénervation complète pour la majorité des études
- Rôle du RAGP ++
- Données évoquant une possibilité de cibler uniquement ce ganglion

Aksu : si débute par RAPV, réponses atténuées pour les autres GPs

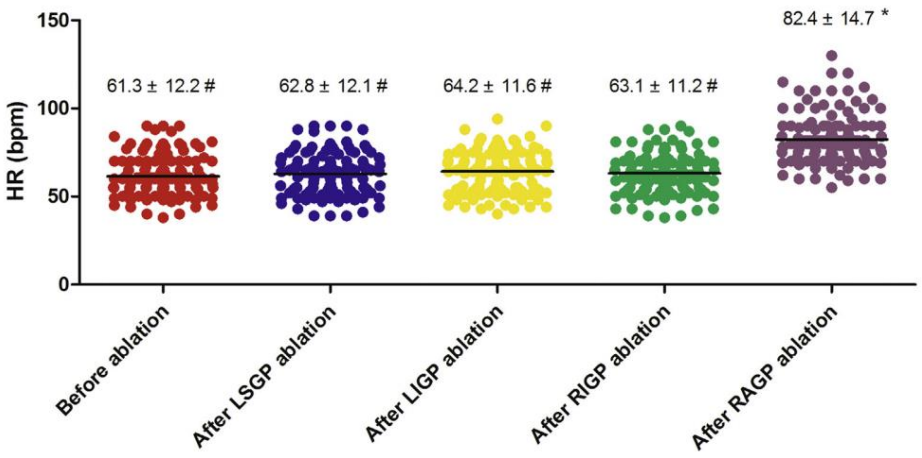
Dénervation complète ou partielle ?

Right anterior ganglionated plexus: The primary target of cardioneuroablation?

Feng Hu, MD, Lihui Zheng, MD, PhD, Erpeng Liang, MD, Ligang Ding, MD, PhD, Lingmin Wu, MD, Gang Chen, MD, Xiaohan Fan, MD, PhD, Yan Yao, MD, PhD, FHRS

METHODS A total of 115 consecutive patients with VVS who underwent cardioneuroablation were enrolled. GPs of the LA were identified by high-frequency stimulation and/or anatomic landmarks being targeted by radiofrequency catheter ablation.

RESULTS During ablation of right anterior ganglionated plexus (RAGP), heart rate increased from 61.3 ± 12.2 bpm to 82.4 ± 14.7 bpm ($P < .001$), whereas during ablation of other GPs only vagal responses were observed. During follow-up of 21.4 ± 13.1 months (median 18 months), 106 participants (92.2%) had no recurrence of syncope or presyncope. Holter data showed that minimal heart rate significantly increased at all follow-up time points (all $P < .05$), and mean heart rate remained higher than baseline 12 months after ablation ($P = .001$).



Eligibilité à une CNA

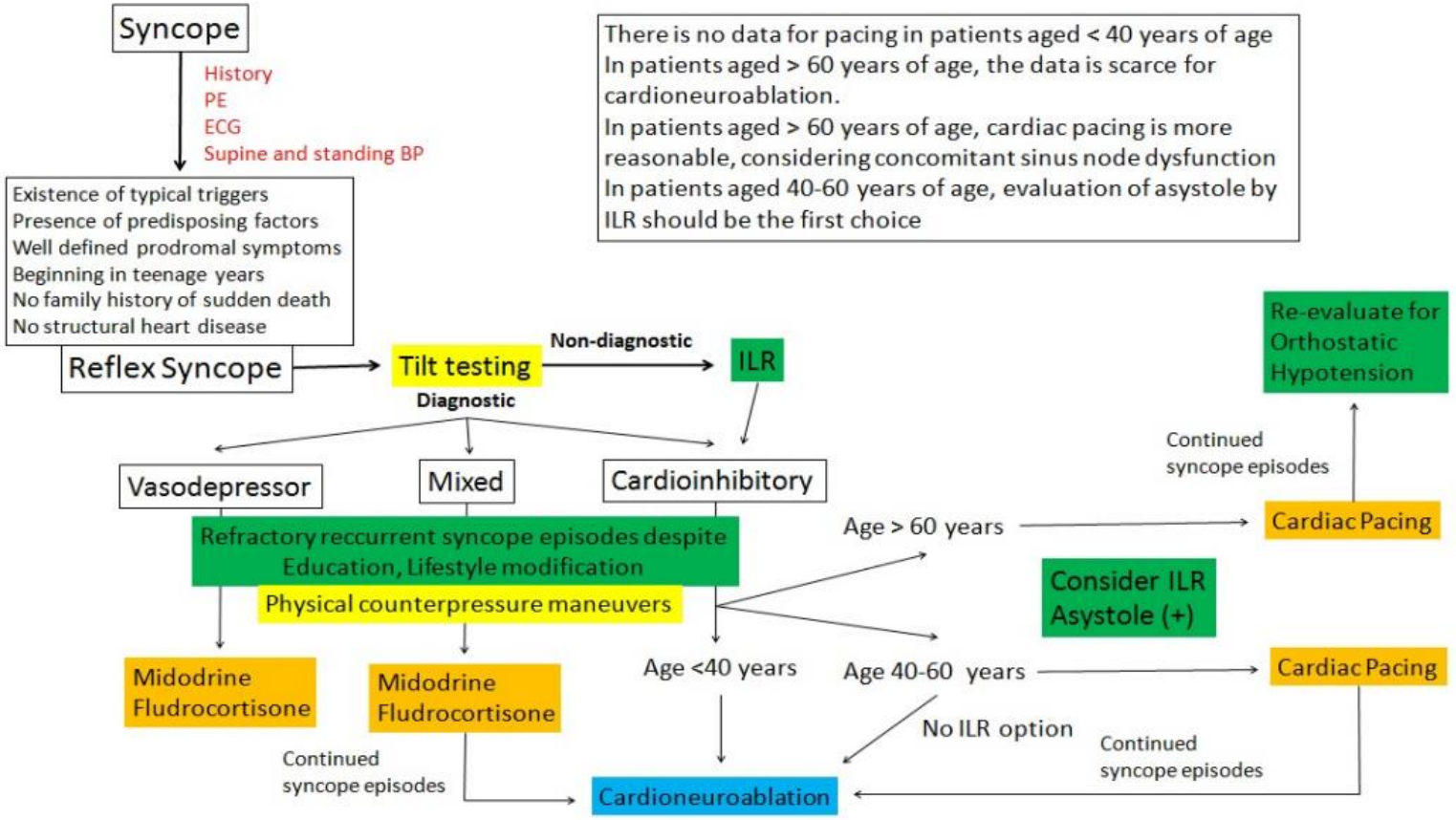


Figure 3: **Diagnostic and therapeutic steps for vasovagal syncope**

En pratique

"CArdioNeuroablation for the treatment of VAsovagal Syncope"
CANVAS

Sponsor code : CHUBX 2021/xx

INTERVENTIONAL RESEARCH PROTOCOL INVOLVING THE HUMAN SUBJECT
(Category 1 research project)

Version no. *1.0* of *04/03/2021*
ID-RCB/ EudraCT number: XXX

This interventional research obtained funding from *source of funding*

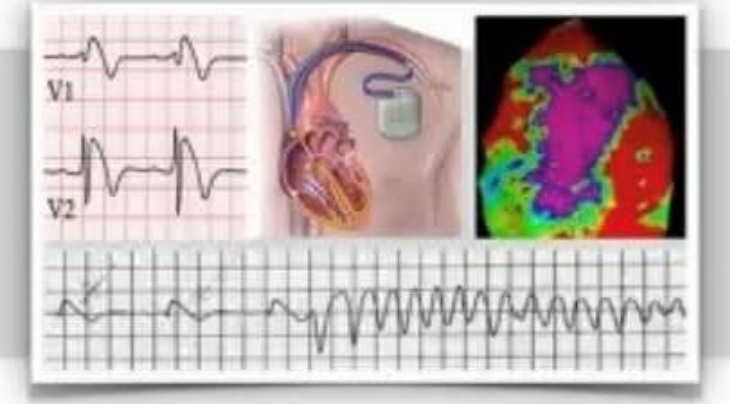
CANVAS

- Essai clinique interventionnel
- Randomisé
- Multicentrique, français
- Procédure CNA vs. Procédure shame
- VVS avec réponse cardio inhibitrice
- Patients porteurs d’un holter longue durée avec longévité > 1 an

Epicardial Ablation in Brugada Syndrome to Prevent Sudden Death: Results from a Randomized Clinical Trial

Giuseppe Ciconte, MD, PhD

Department of Arrhythmia and Electrophysiology
IRCCS Policlinico San Donato, Milano, Italy



ClinicalTrials.gov Identifier:

NCT03294278

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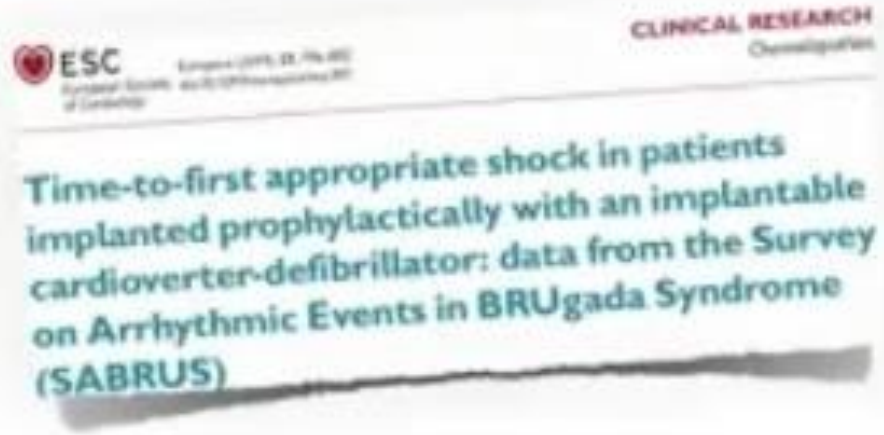
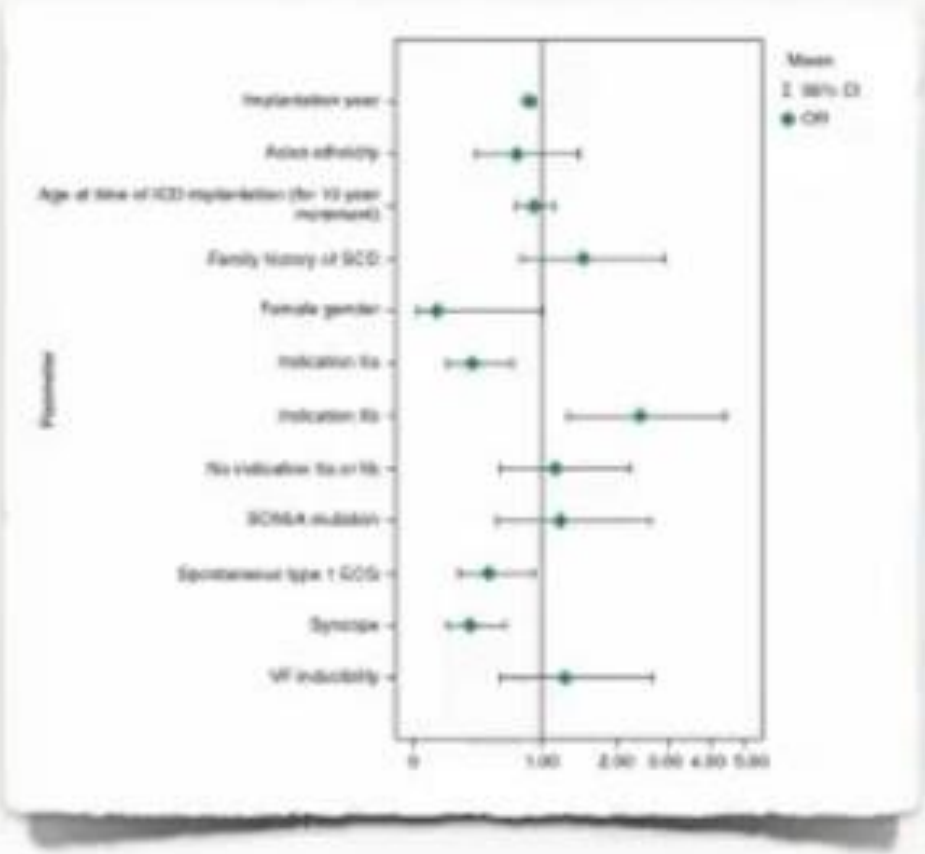
Malignant Arrhythmias



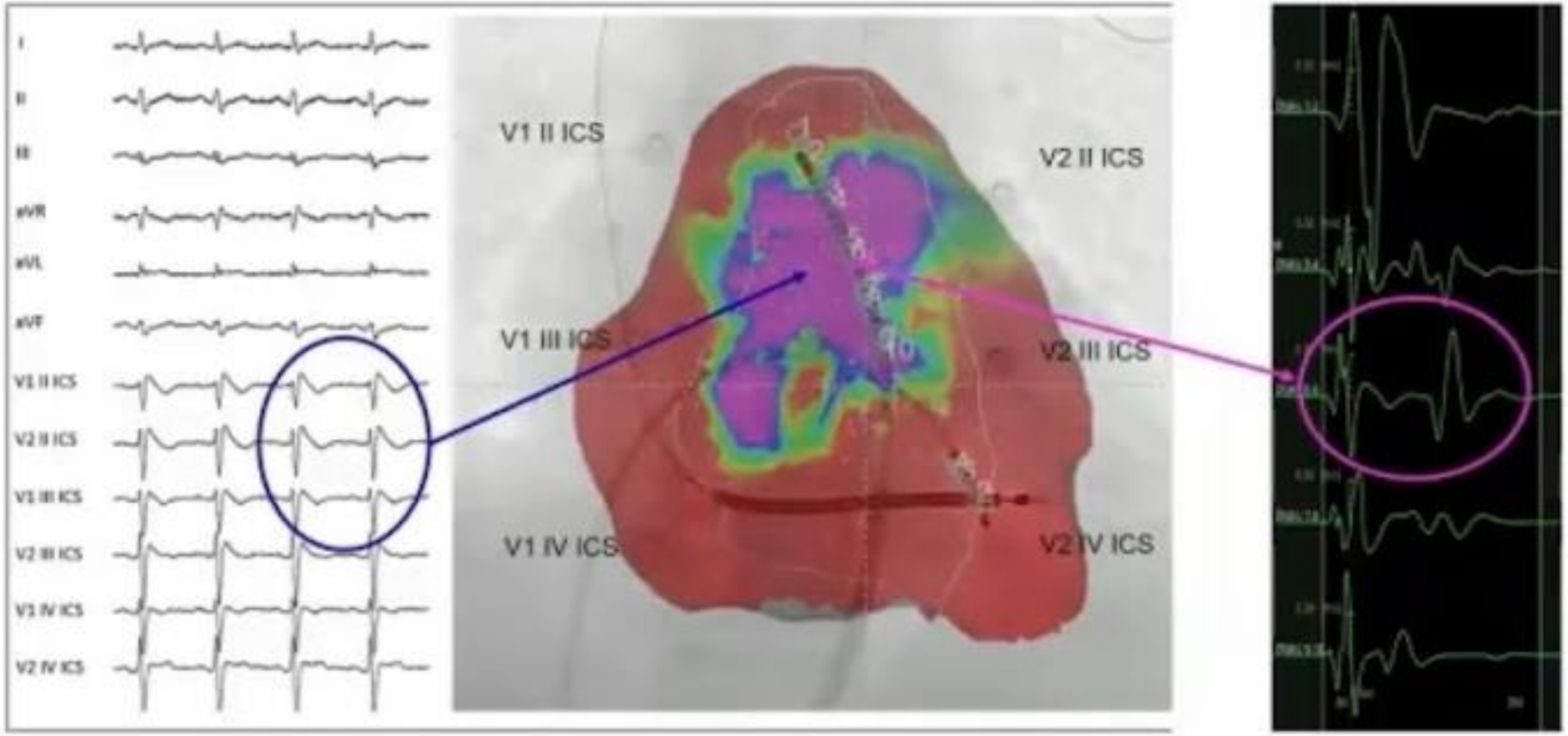
- 678 BrS with arrhythmic event (AE)
  - 252 pts had AE after prophylactic ICD
- The median time-to-first appropriate ICD therapy was 24.8 ± 2.8 months
- **76.6%** of BrS with primary prevention ICD had the AE during the first 5 years

- Class IIa indication predictor for ≤5 years-to-shock ($p < 0.01$; OR 0.38; 95% CI 0.2–0.71
- Class IIb indication predictor for >5 years-to-shock ($P < 0.01$; OR 2.41; 95% CI 1.32–4.22)



Milman A, et al. Europace 2019

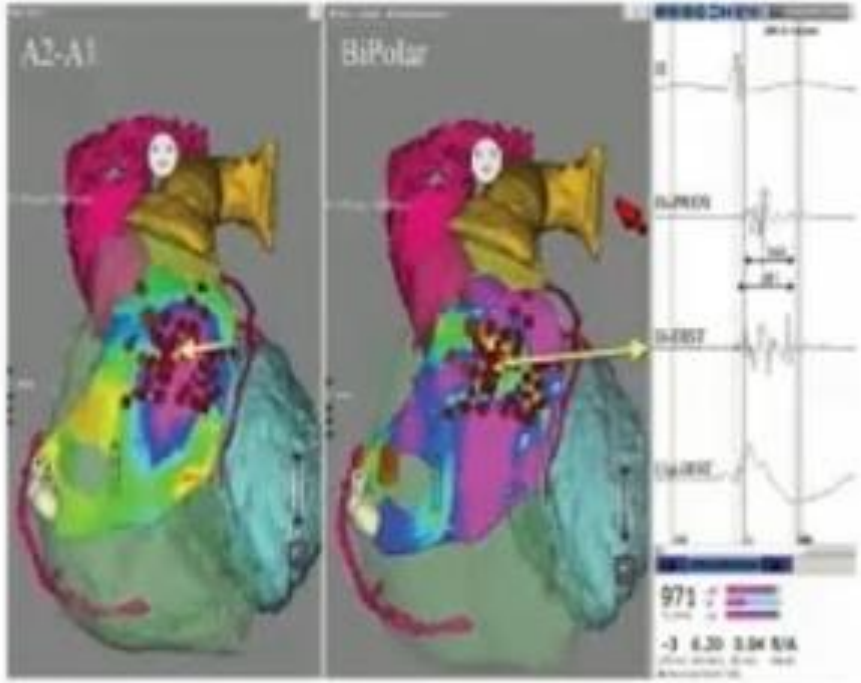
Substrat arythmogène dans le Brugada



Epicardial Catheter Ablation

Prevention of Ventricular Fibrillation Episodes in Brugada Syndrome by Catheter Ablation Over the Anterior Right Ventricular Outflow Tract Epicardium

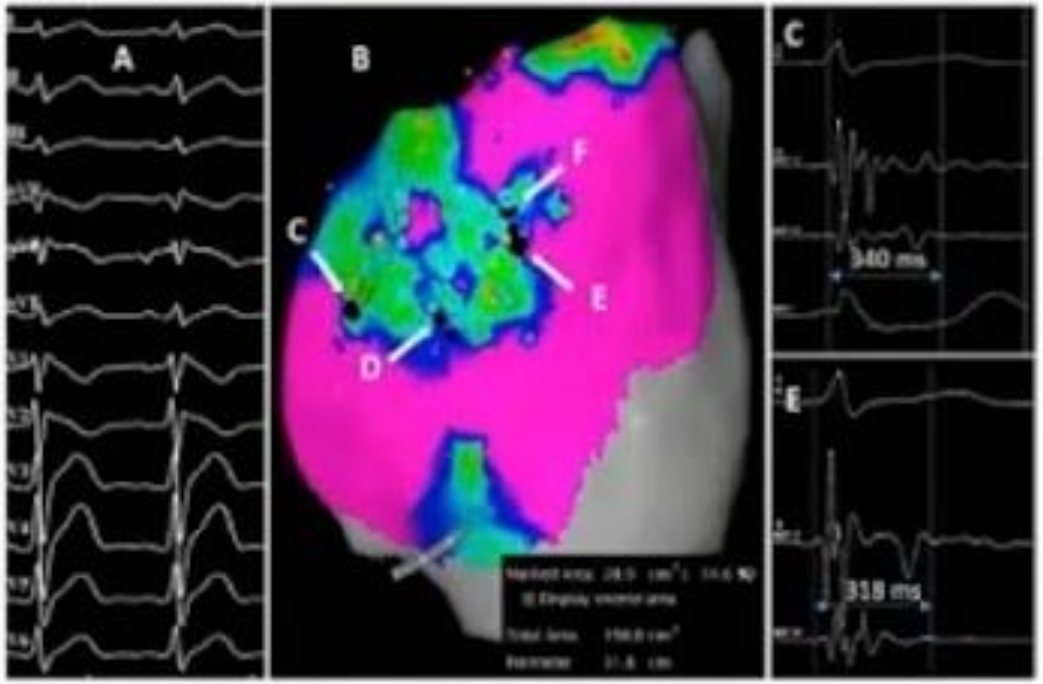
Koonlawee Nademanee, Gunpanat Veerakul, Pakorn Chandanamattha, Lertlak Chaothawee, Aekarach Ariyachaipanich, Kriengkrai Jirasirirojanakorn, Khunchit Likittanasombat, Kiertijai Bhuripanyo and Tachapong Ngarmukos



Circulation. 2011 Mar 29;123(12):1270-9.

Brugada Syndrome Phenotype Elimination by Epicardial Substrate Ablation

Josep Brugada, MD*; Carlo Pappone, MD, PhD*; Antonio Berruezo, MD, PhD; Gabriele Vicedomini, MD; Francesco Manguso, MD, PhD; Giuseppe Ciconte, MD; Luigi Giannelli, MD; Vincenzo Santinelli, MD



Circ Arrhythm Electrophysiol. 2015 Dec;8(6):1373-81.

Objectifs de l’étude

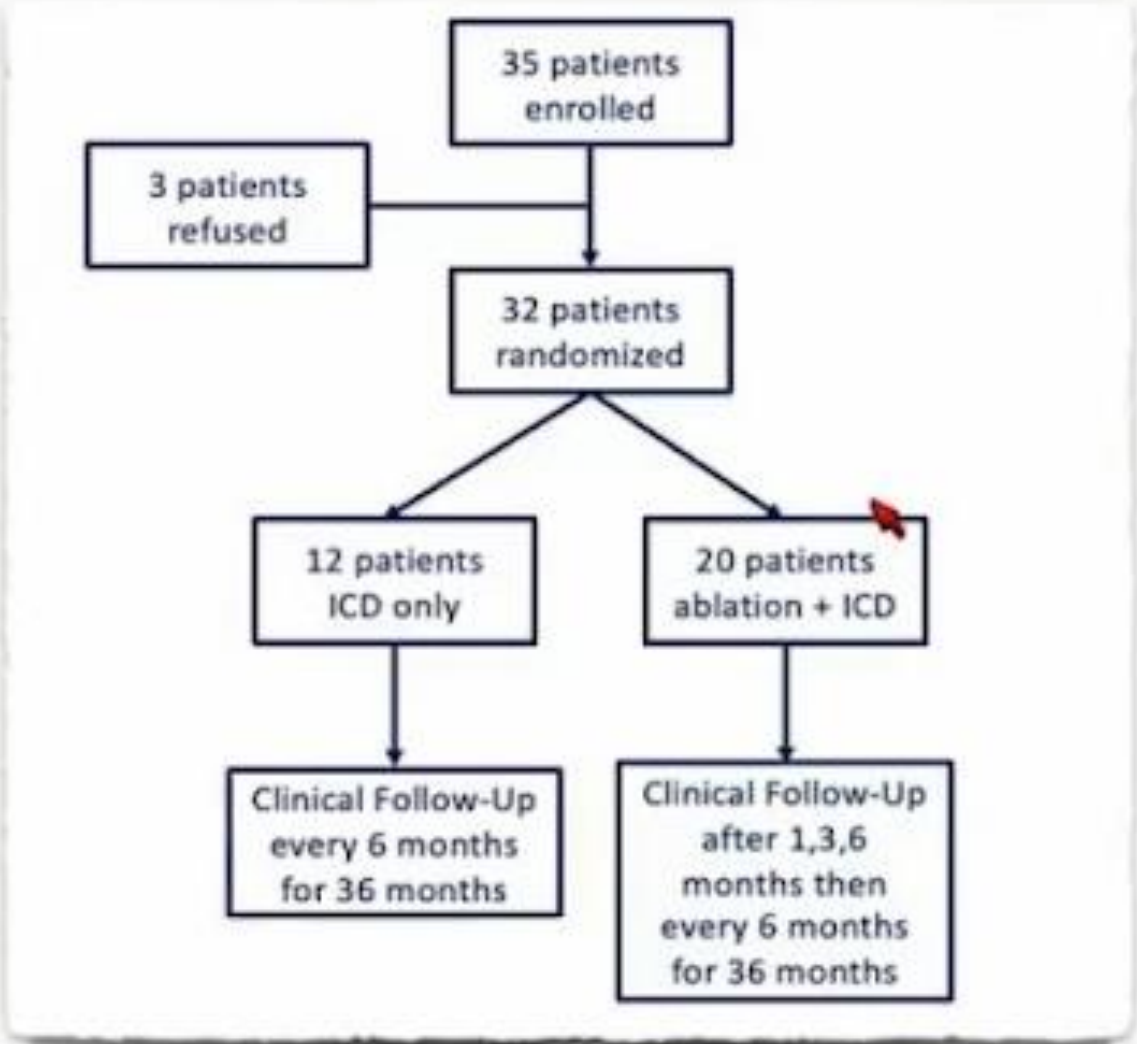
- Définir par les preuves, le traitement optimal des patients présentant des arythmies ventriculaires secondaires à un Brugada,
- Patients randomisés ablation epicardique + DAI versus DAI seul
- Survie libre d’arythmie ventriculaire

Méthodes

- Critères d'inclusion:
  - Brugada
  - Mort subite ou ≥ 1 thérapie appropriée avec le DAI
  - Documentation de l'arythmie ventriculaire
  - Age ≥18ans

- Critères d'exclusion:
  - grossesse
  - CI à l'AG ou l'ablation épicardique
  - survie < 12 mois

STUDY DESIGN



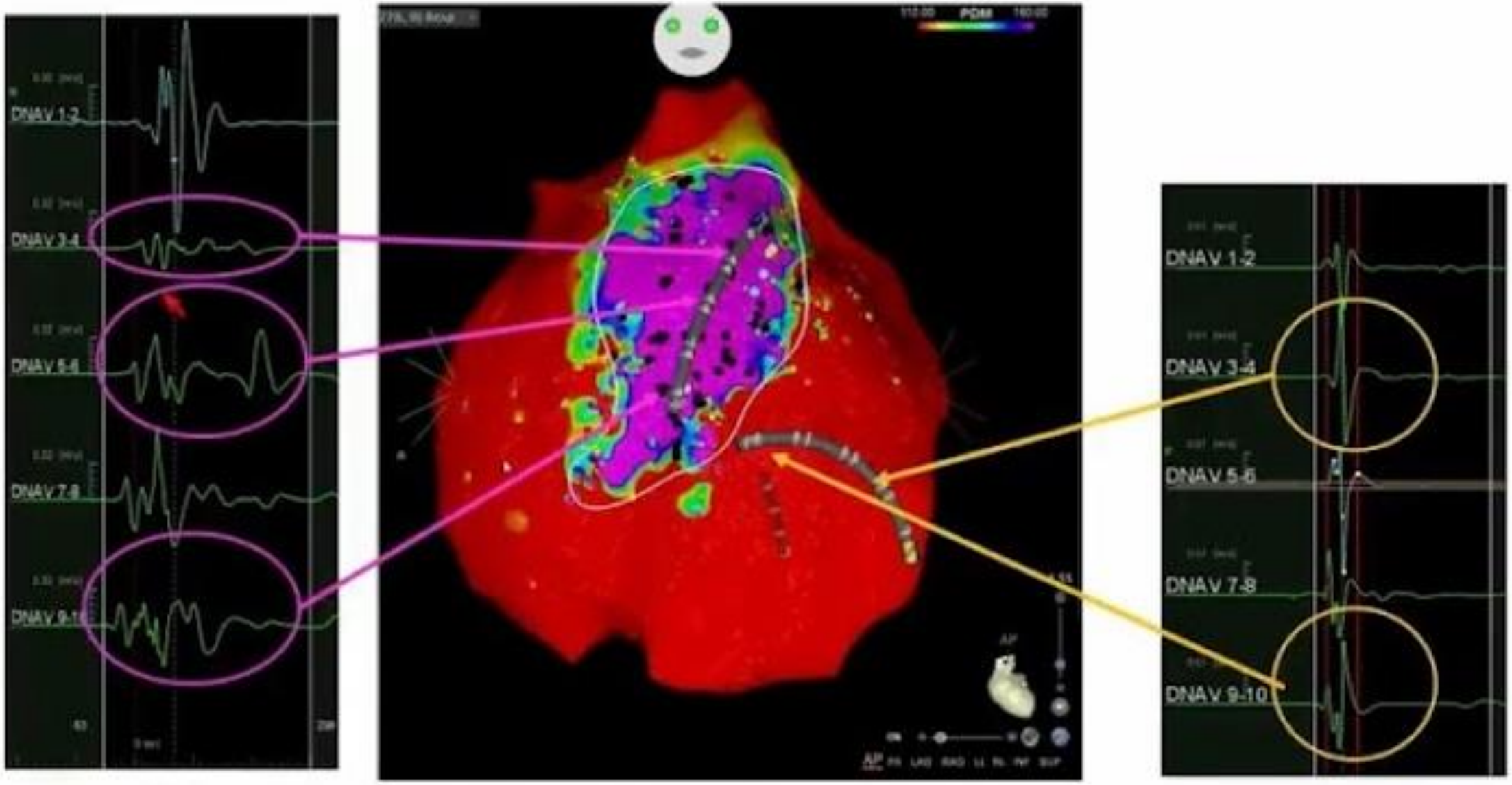
- Prospective, single-centered study since September 2017.
- A projected 150 patients enrolled and randomized to receive ablation or not in a 2:1 fashion (Ablation+ICD 105 patients vs ICD only arm 45 patients).
- All patients were then clinically followed up every 6 months for the ICD only group and after 1, 3 and 6 months then every 6 months for the ablation and ICD group.

STUDY POPULATION

	Overall (n=32)	Ablation (n=20)	ICD (n=12)	p-value
Age, years ± SD	43.1±16.9	44.0±16.0	40.2±13.3	0,49
Male gender, n (%)	27 (84.4)	16 (80.0)	11 (91.7)	0.62
Spontaneous type 1 ECG, n (%)	17 (22.7)	12 (60.0)	5 (41.6)	0.46
Family history of SD, n (%)	23 (71.8)	15 (75.0)	8 (66.6)	0.69
Previous atrial arrhythmias, n (%)	12 (37.5)	7 (35.0)	5 (41.7)	0.72
Inducible at EPS, n (%)	25 (78.1)	16 (80.0)	9 (75.0)	1.00
SCN5A mutations, n (%)	11 (34.4)	7 (35.0)	4 (33.3)	1.00
Previous Aborted SD	22 (68.8)	15 (75.0)	7 (58.3)	0.44
Appropriate shocks pre RFA, mean ± SD (range)	2.2 ± 2.1 (1-10)	2.6 ± 2.0 (1-10)	1.5 ± 0.9 (1-4)	0.11

Phenotype Ablation (Late Potentials Abolition)

AJMALINE Epi Mapping

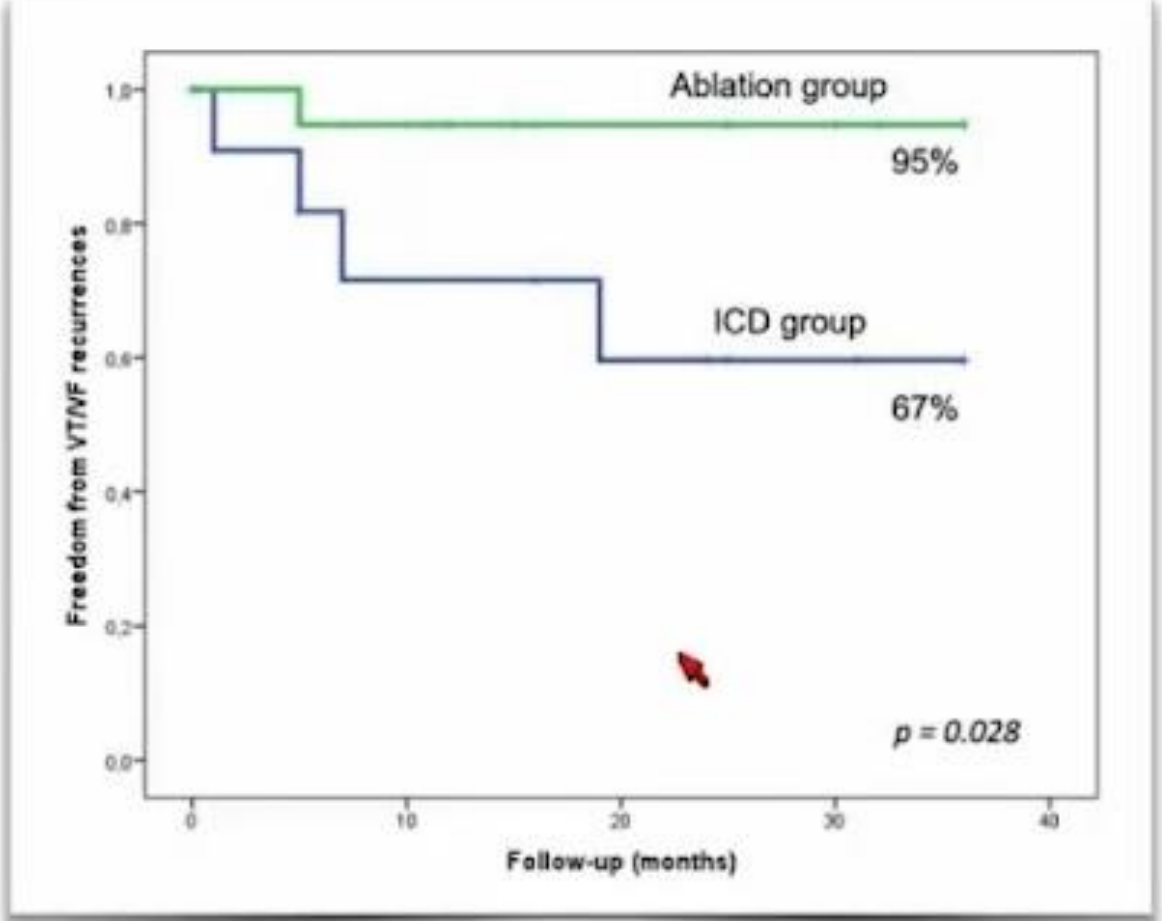


RF Catheter Ablation

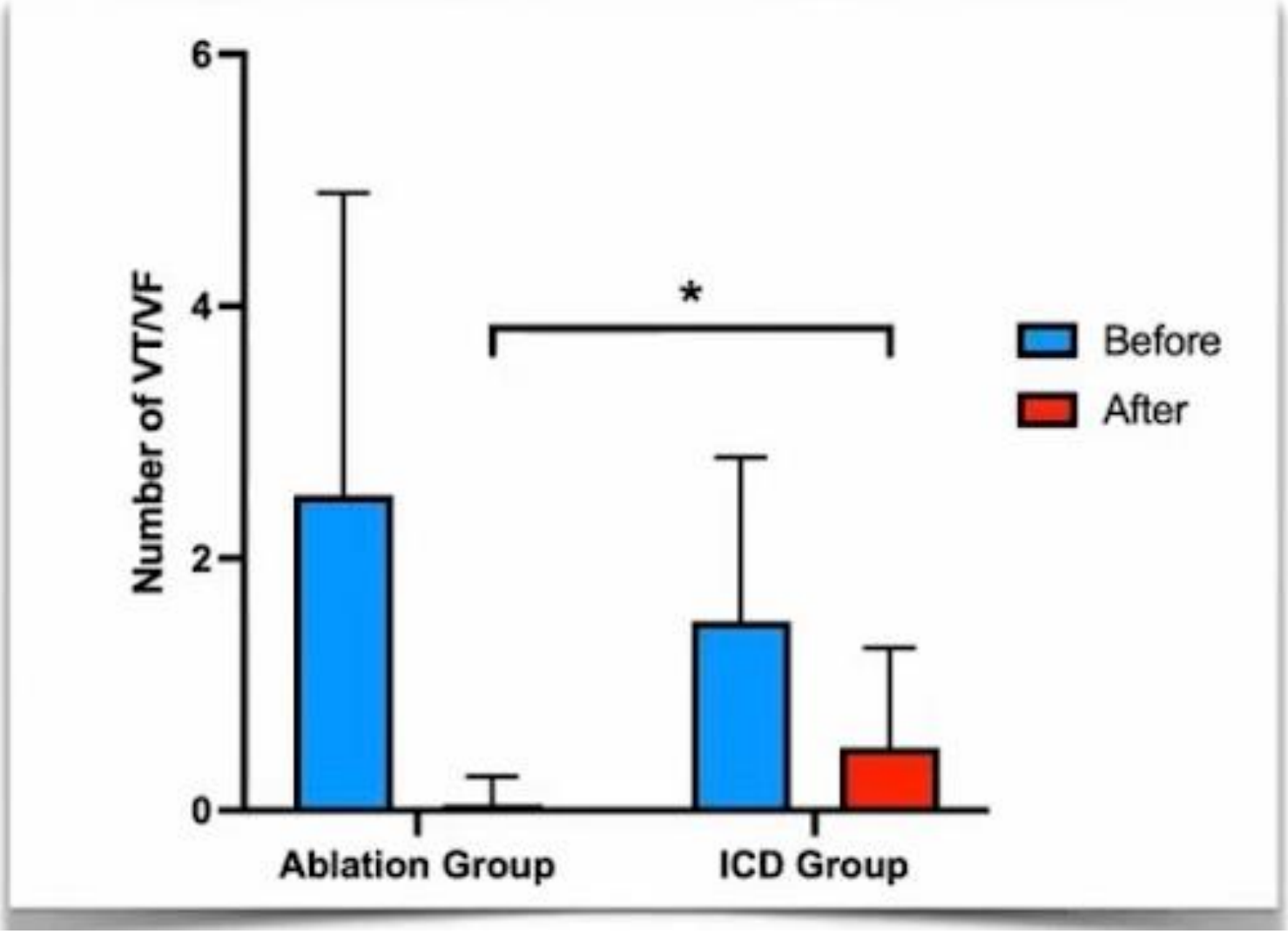
Outcome – VT/VF Survival

Follow-up time: 21.3 ±13.2 months

- ICD Group: 33% (4/12 pts)
- Ablation Group: 5% (1/20 pts)



VT/VF burden before and after randomization



complications

- 2 épanchements péricardiques
  - TT PAR COLCHICINE
  - 1 drainage péricardique

Conclusions de l’auteur

- Anomalies électriques épicardiques sont la signature du Brugada
- L’ablation est une procédure fiable pour les patients à risque de mort subite
- L’ablation réduit l’incidence des arythmies ventriculaires et prévient les thérapies via le DAI
- Ce concept ouvre la voie à d’autres thérapeutiques envisageables dans le Brugada