médipôle
LYON-VILLEURBANNE

Ramsay
Santé
Clinique de la Sauvegarde

Infirmerie
Protestante
de Lyon
Fondée en 1844 Clinique Médico-chirurgicale

A.D.R.I.S
ASSOCIATION DE RYTHMOLOG
INTERVENTIONNELLE & STIMULATIO

Cardioneuroablation

Cyril ZAKINE

Introduction

- La syncope vasovagale est l'un des types de syncope les plus courants. À 60 ans, 42 % des femmes et 32 % des hommes ont déjà eu au moins un épisode de syncope. [1]

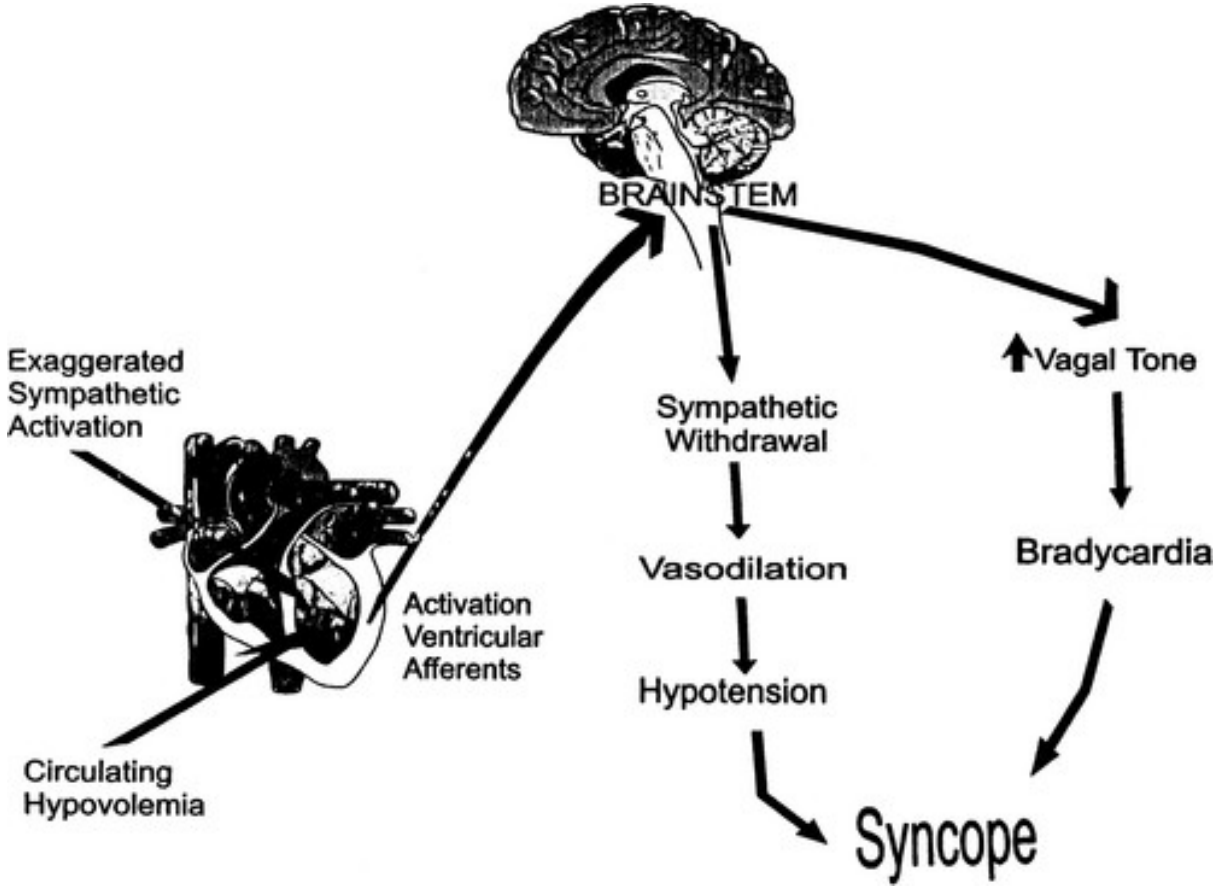
- Conséquences généralement bénignes, elles peuvent être traumatiques et affecter la qualité de vie. [2]

- Résultats décevants des traitements traditionnels avec récidive dans au moins 25% des cas.[3]

1. *Serletis A et al. Eur Heart J 2006*
2. *Rose MS et al. J Clin Epidemiol 2000*
3. *Sheldon RS et al. Heart Rhythm 2015*

La physiopathologie sous-jacente résulte d'un réflexe provoquant une hypotension et une bradycardie, médiée par une **activation excessive de l'activité vagale**.

Sheldon RS et al. Heart Rhythm 2015



10.1161/01.cir.102.23.2898

Classification VASIS modifiée

Class	Description	Definition
I	mixed	Decrease in heart rate >10%, minimal heart rate >40 bpm or less than 40 bpm for less than 10 sec with or without asystole of less than 3 sec. Blood pressure falls before heart rate.
IIa	cardioinhibitory without asystole	Minimal heart rate <40 bpm for >10 sec, but asystole of more than 3 sec does not occur. Blood pressure falls before heart rate.
IIb	cardioinhibitory with asystole	Asystole occurs for more than 3 sec. Heart rate coincides with or precedes blood pressure fall.
III	vasodepressor	Decrease in heart rate <10% of maximal heart rate.

doi:10.1371/journal.pone.0026489.t001

Un peu d'anatomie

- 2 composantes du SNA
  - Extrinsèque : SNC et nerfs extra cardiaque
  - Intrinsèque : neurones surface épicardique ou tissu adipeux épicardique

- Fibre parasympathique <u>courte, corps neural étant dans le cœur</u>

- <u>Plexus ganglionnaire (**GP**):</u> groupes de ganglions autonomes situés au niveau des oreillettes

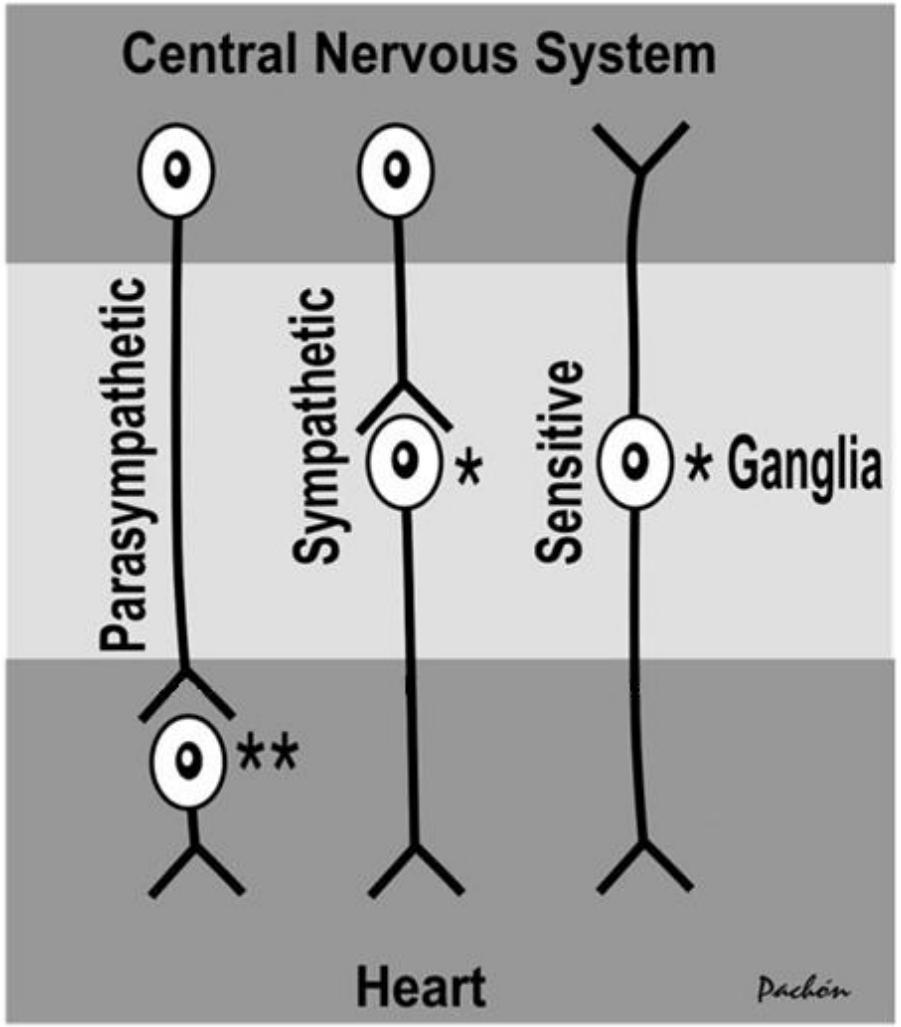
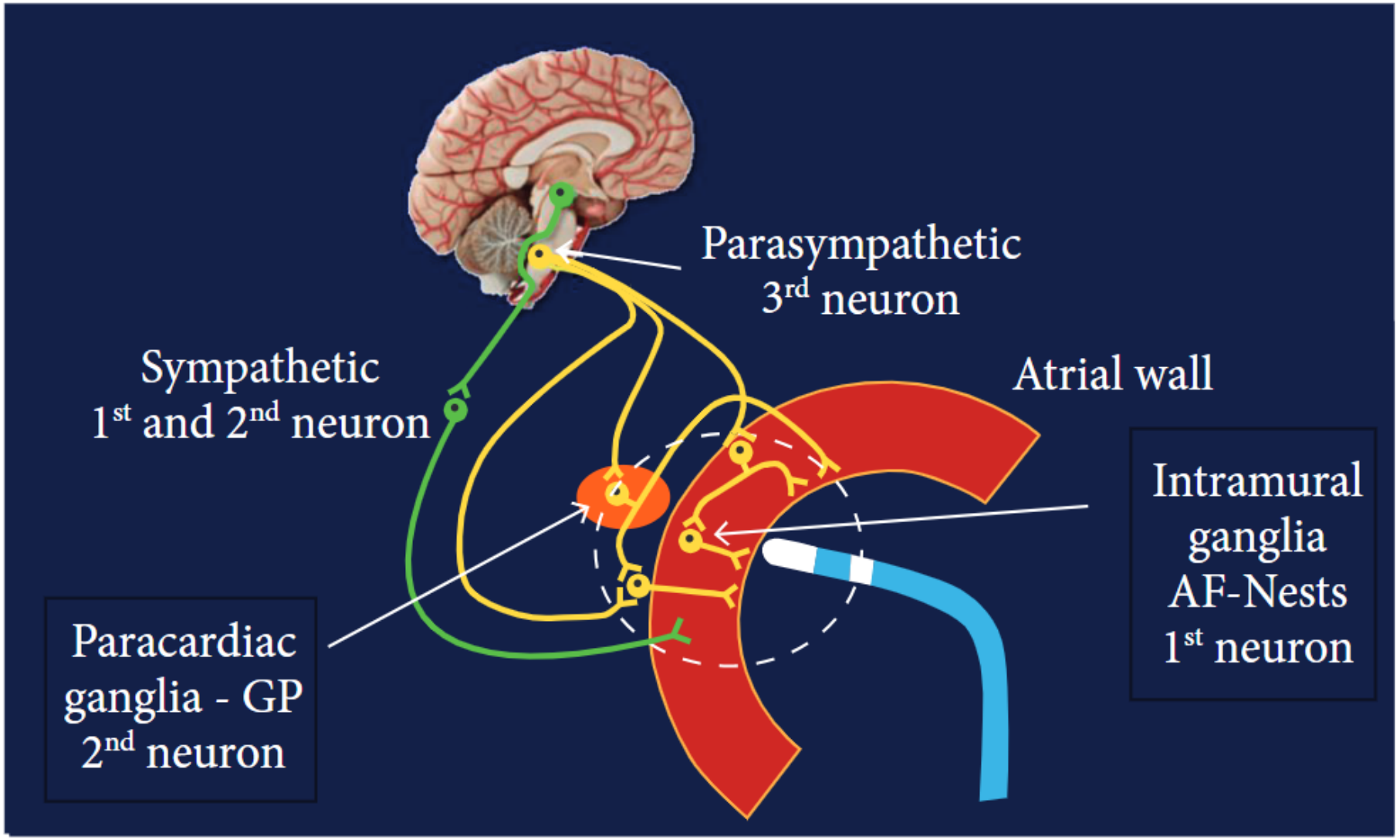


Figure 5 Schema of cardiac innervation. *Postganglionic sympathetic and sensory cells located in ganglia far from the heart; **cells of the postganglionic parasympathetic neurones located in the atrial wall or in the para-cardiac ganglia; RF: structures affected by catheter RF-ablation in the atrial wall. The parasympathetic innervation is the most affected due to postganglionic neuronal cell elimination.

J.C. Pachon M et al. Europace 2005



Pachon et al. J. Cardiac Arrythmias 2019

Un peu d'anatomie

- L'épaisseur moyenne de la paroi auriculaire ≈3 mm

- Ablation possible des GP via l'endocarde *doi.org/10.15420/aer.2023.02*

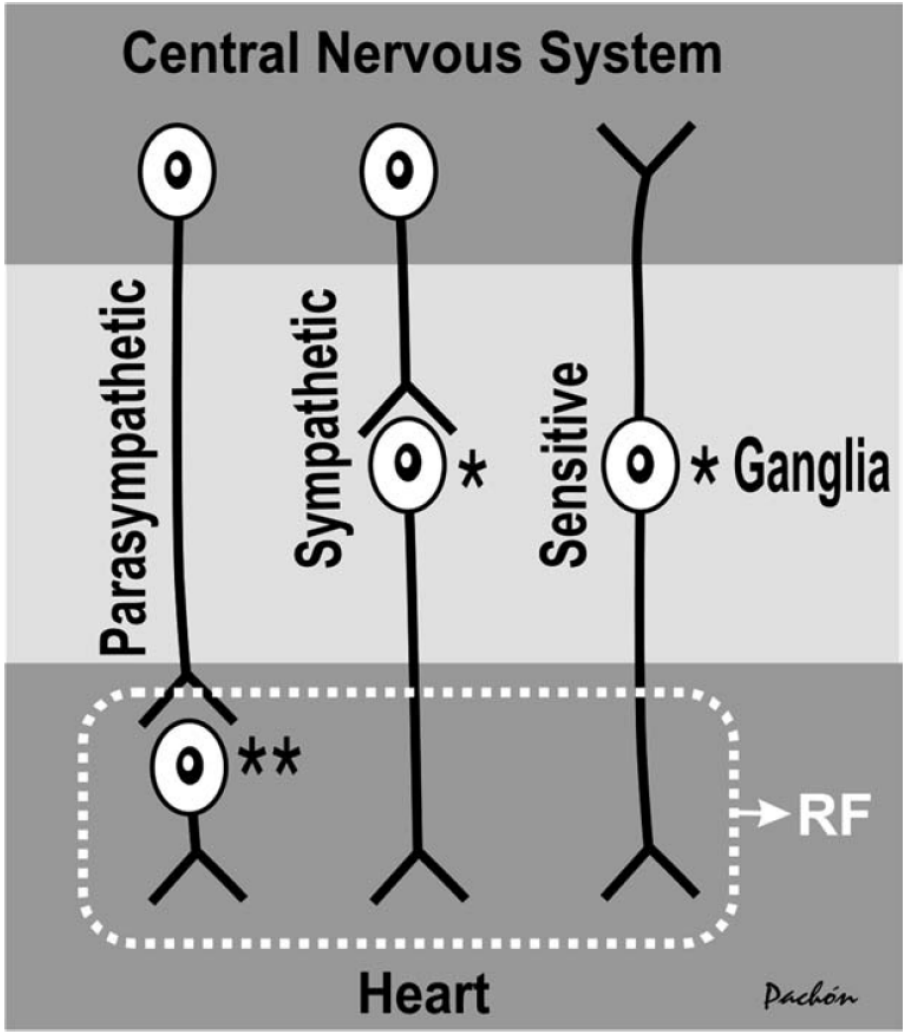


Figure 5 Schema of cardiac innervation. *Postganglionic sympathetic and sensory cells located in ganglia far from the heart; **cells of the postganglionic parasympathetic neurones located in the atrial wall or in the para-cardiac ganglia; RF: structures affected by catheter RF-ablation in the atrial wall. The parasympathetic innervation is the most affected due to postganglionic neuronal cell elimination.

J.C. Pachon M et al. Europace 2005

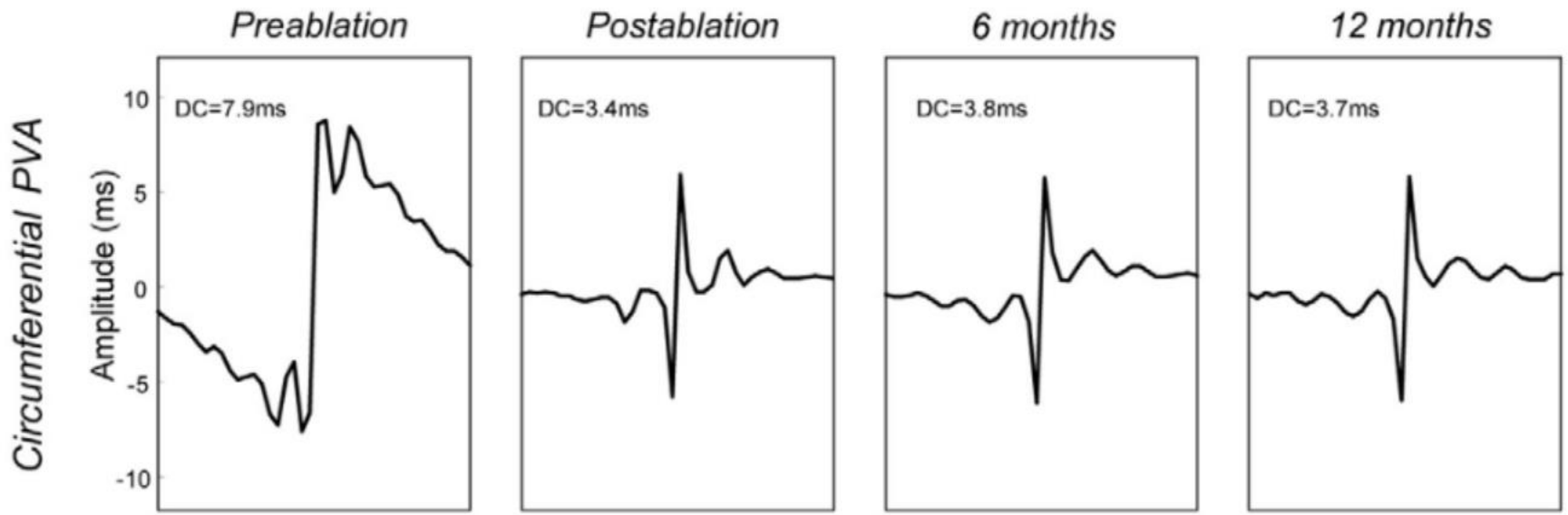


Figure 1 Representative deceleration-related phase-rectified signals (PRSA signals) in a patient undergoing circumferential pulmonary vein ablation (PVA; *upper panels*) and a patient undergoing segmental pulmonary vein ablation (*lower panels*) the day before ablation, the day after ablation, and 6 and 12 months after ablation. PRSA signals visualize average deceleration-related oscillations of heart rate observed over 24 hours. Oscillations of different frequencies are phase rectified at the center of the PRSA signal where their amplitudes compound to each other. The central amplitude of the PRSA signal is quantified by deceleration capacity (DC). The "i" denotes position relative to the anchors (see Methods section for details).

Bauer et al. Heart Rhythm 2006
https://doi.org/10.1016/j.hrthm.2006.08.025

Europace. 2005 Jan;7(1):1-13. doi: 10.1016/j.eupc.2004.10.003.

"Cardioneuroablation"--new treatment for neurocardiogenic syncope, functional AV block and sinus dysfunction using catheter RF-ablation

Jose C Pachon [1], Enrique I Pachon, Juan C Pachon, Tasso J Lobo, Maria Z Pachon, Remy N A Vargas, Adib D Jatene

- 1ère série de 20 patients :
  - 5 pts syncope vaso vagale type IIB,
  - 7 pts BAV complets fonctionnels,
  - 13 pts dysfonction sinusale

- Cible les GP par analyse spectrale et approche anatomique

Localiser les GP

- Approche anatomique
- Analyse spectrale
- Stimulation haute fréquence

Approche anatomique

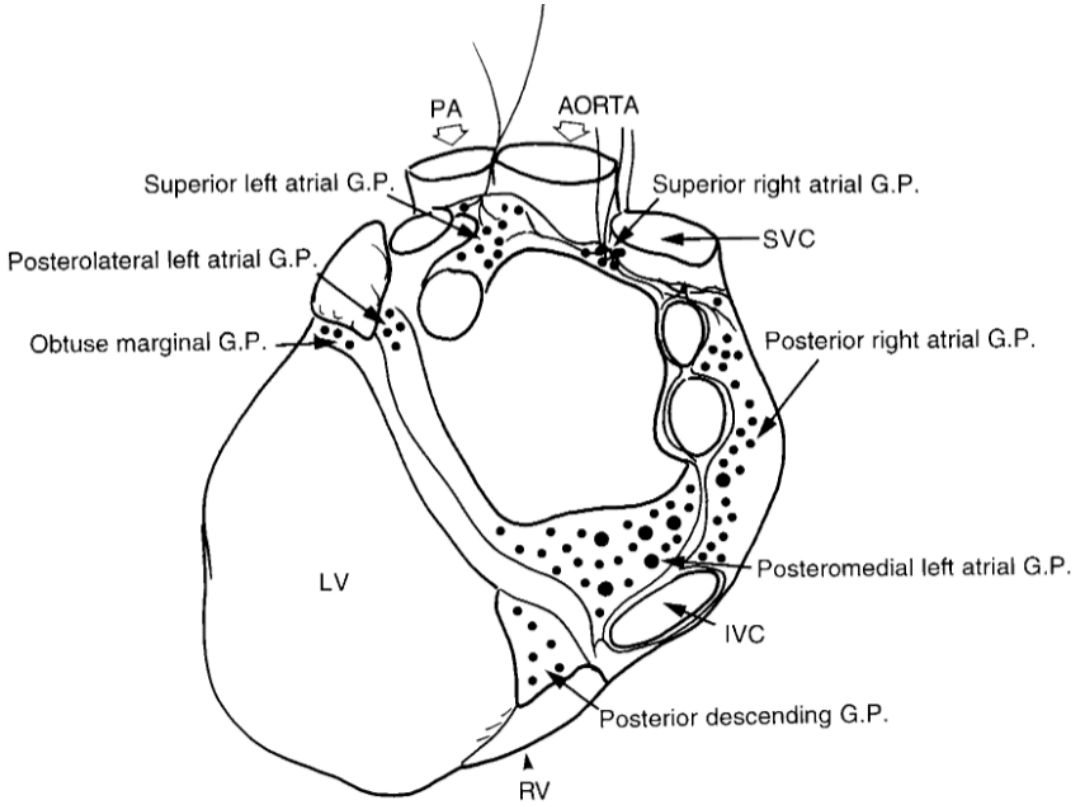


Fig. 1. Drawing of a posterior view of the human heart and major vessels illustrating the locations of posterior atrial and ventricular ganglionated plexuses. Note the mediastinal nerves coursing adjacent to the aortic root and joining the two superior atrial ganglionated plexuses. Positions of the superior vena cava (SVC), inferior vena cava (IVC), right ventricle (RV), and left ventricle (LV) are shown.

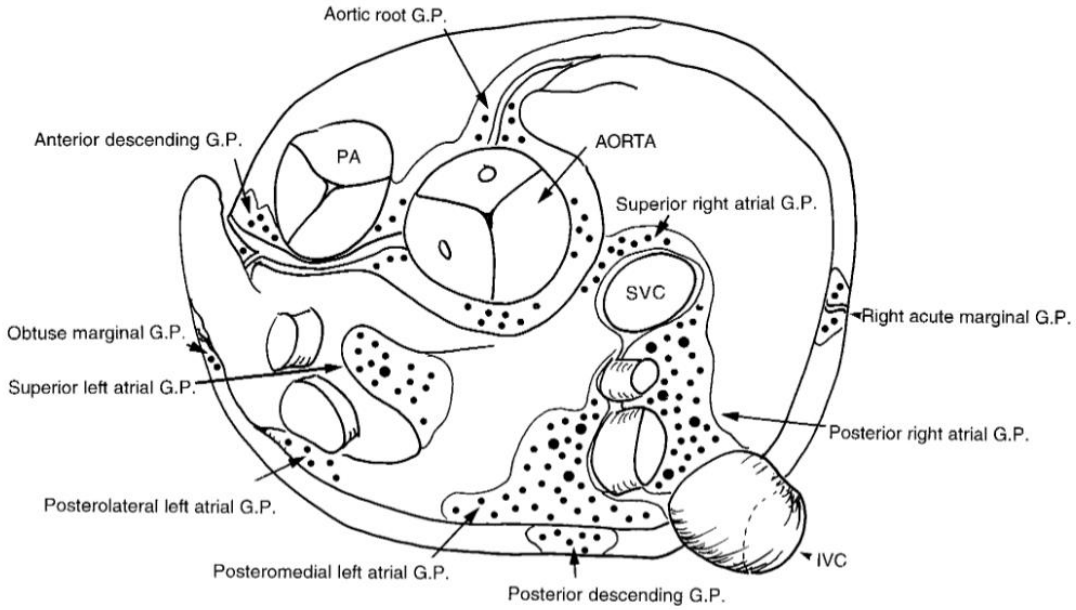
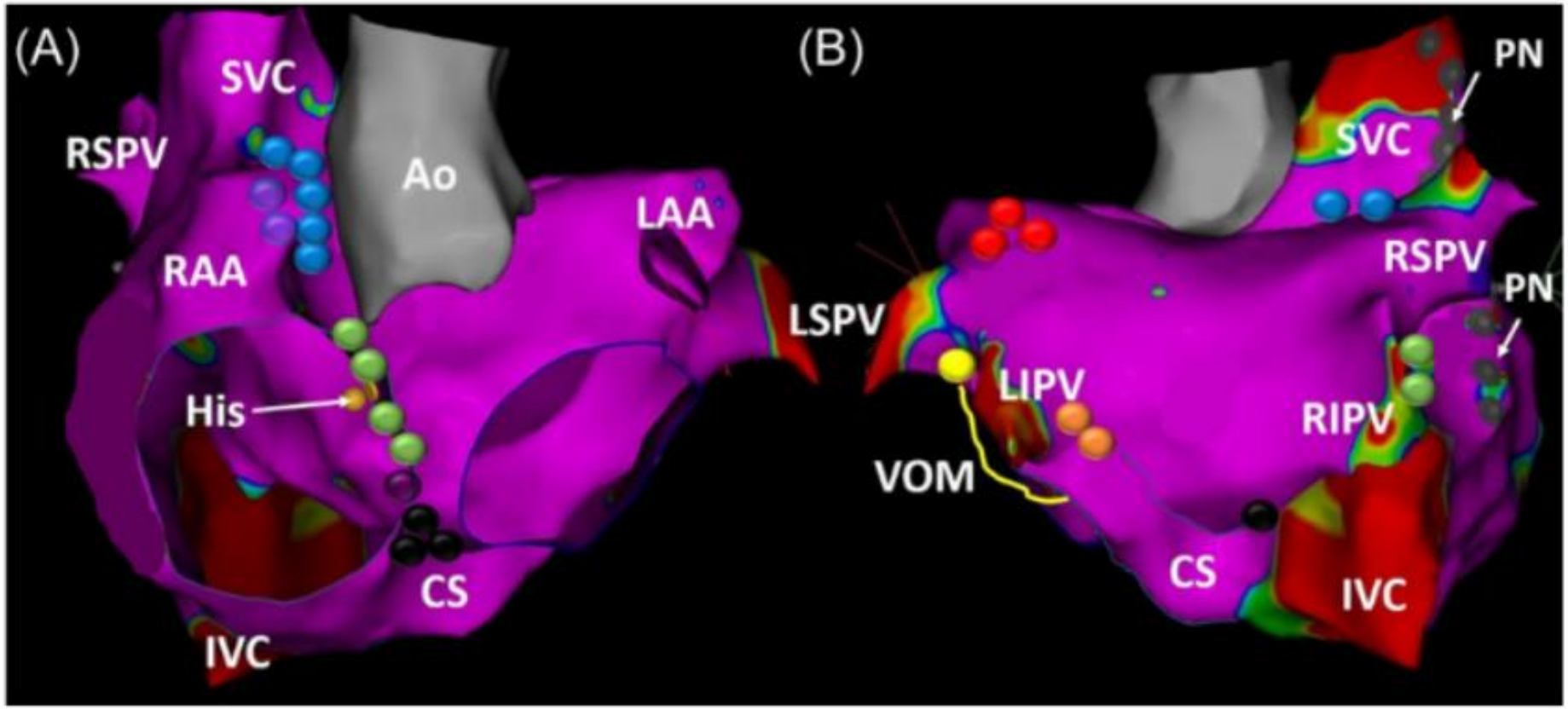


Fig. 2. Drawing of a superior view of the human heart illustrating the distribution of ganglionated plexuses on the surface of the atria and ventricles. For abbreviations, see Figure 1.

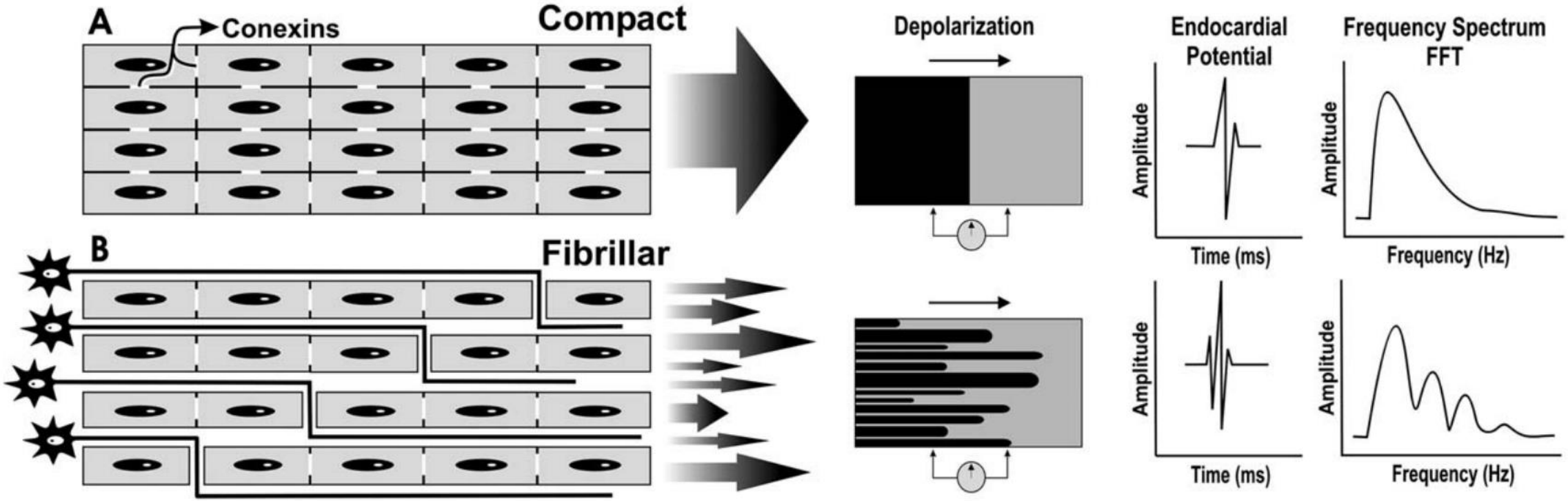
Armour et al. The Anatomical Record 1997



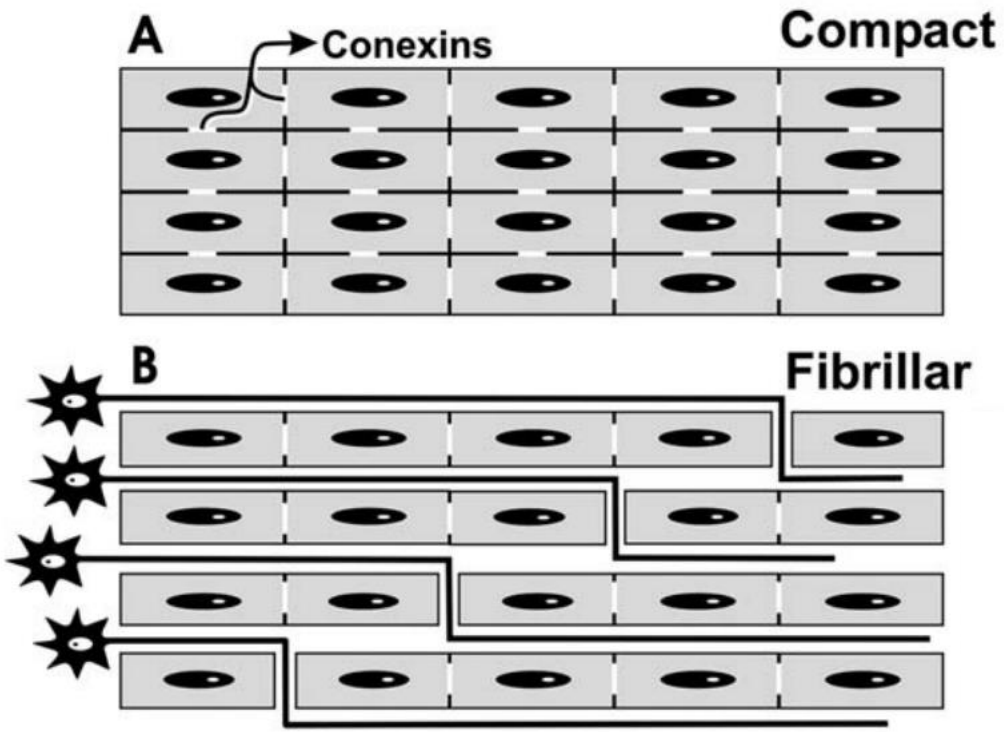
GP supérieur droit et gauche
GP postérieur droit
GP supérieur latéral et postéro latéral gauche
GP postéro médial gauche
Veine de Marshall

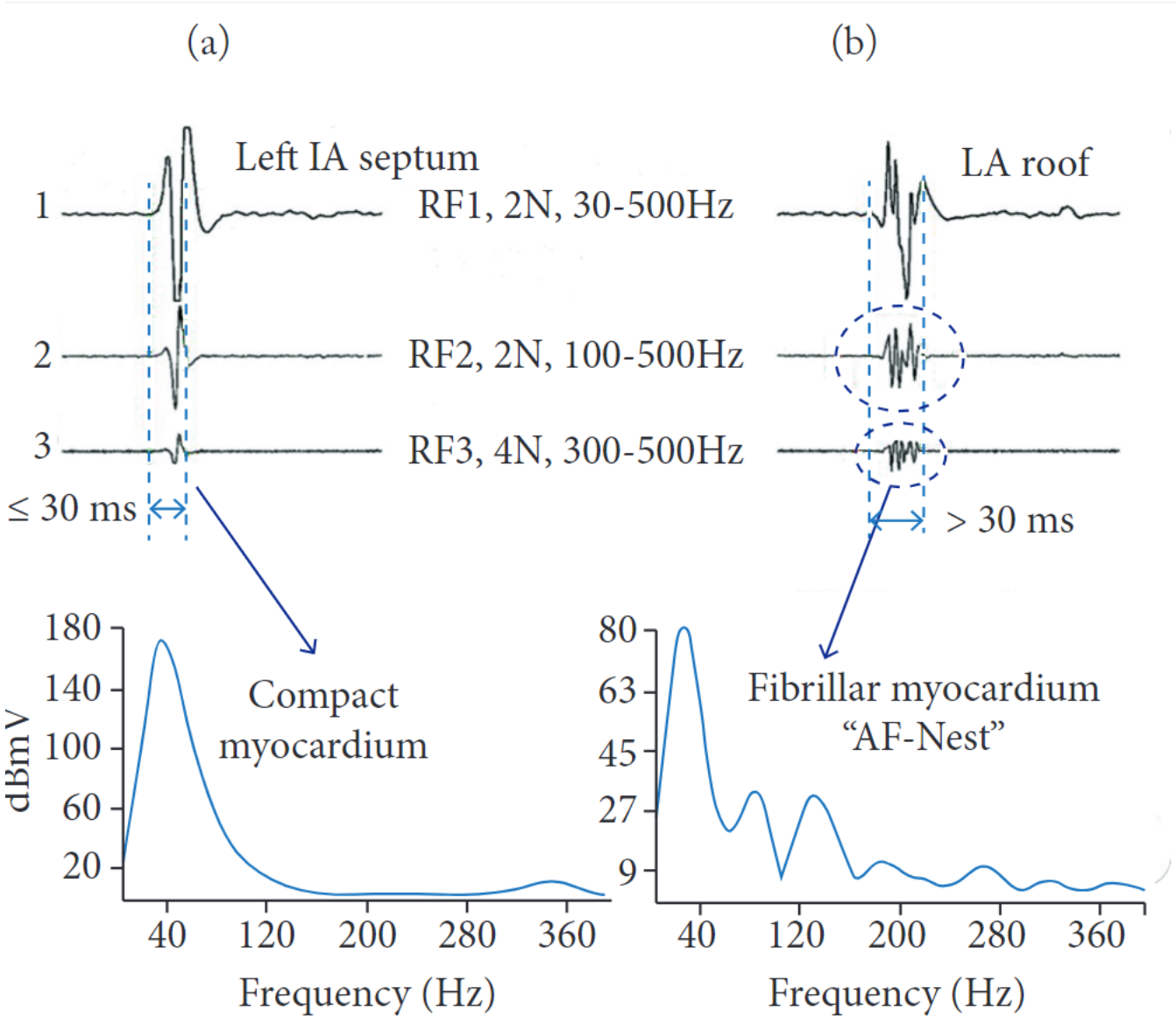
T. AKSU et al. Journal of cardiovascular electrophysiology, 2022.

Analyse spectrale

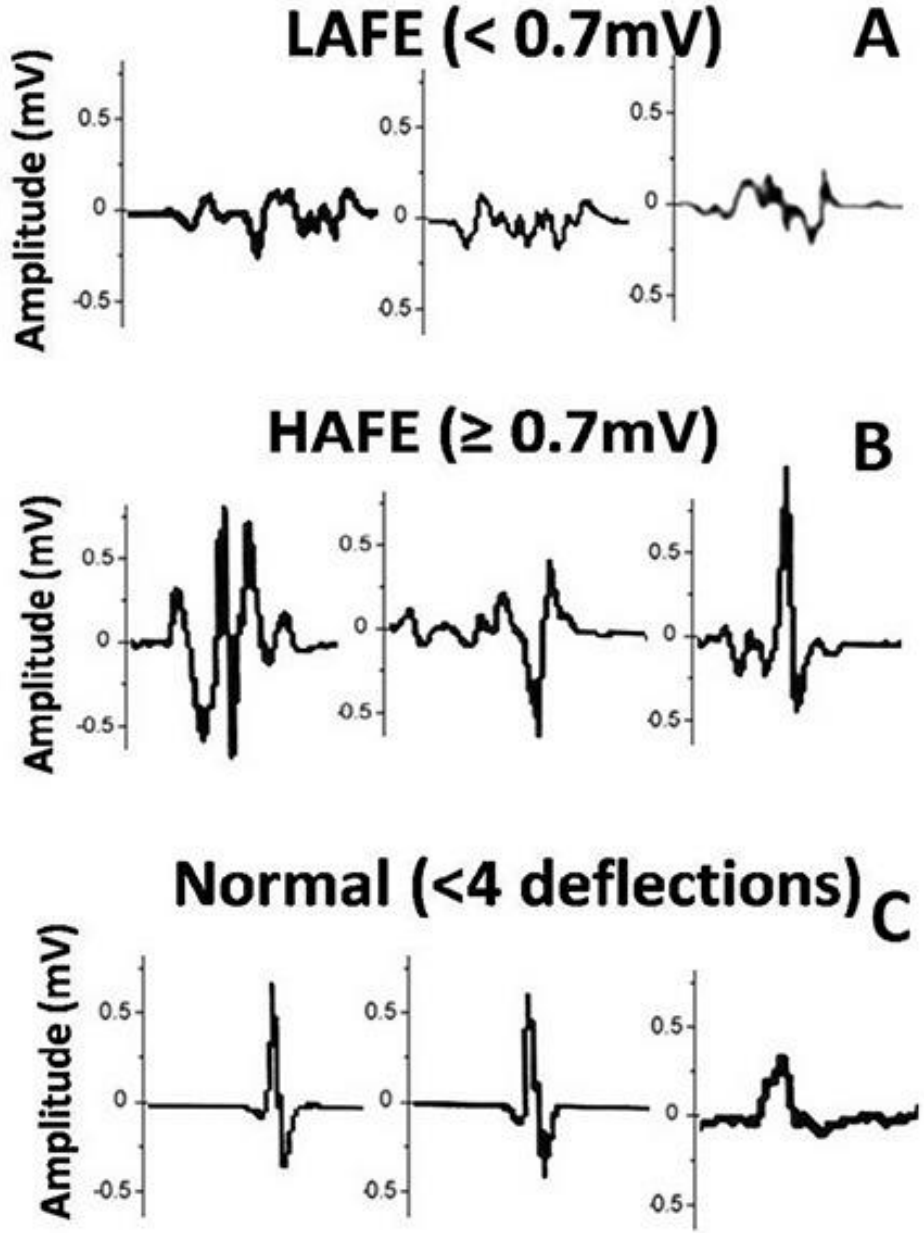


Pachon et al. Europace 2005

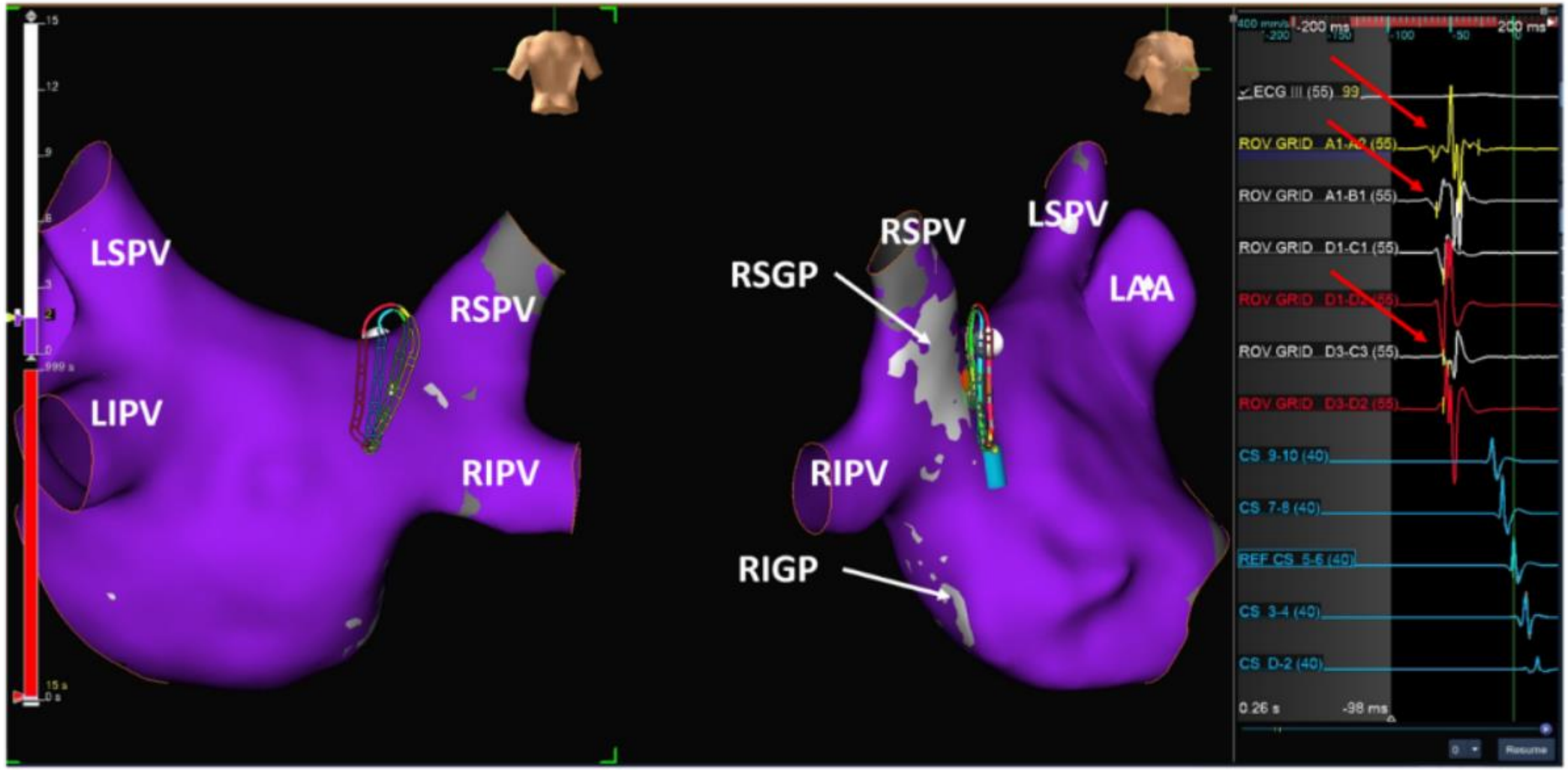


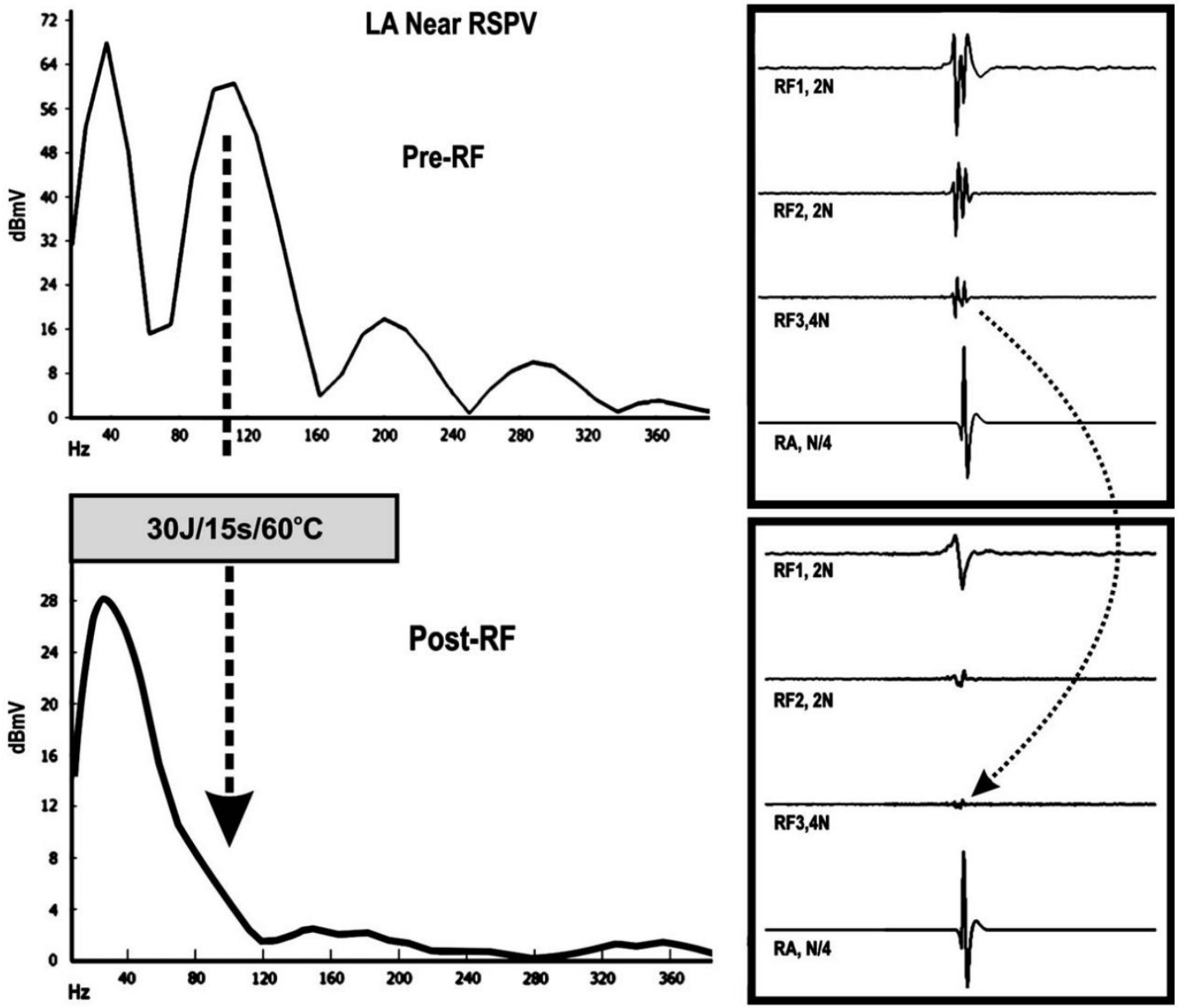


Pachon et al. Europace 2005



T. Aksu et al. Balkan Med Journal 2019.


LSPV
RSPV
LIPV
RIPV
RSGP
RSPV
LSPV
LAA
RIPV
RIGP
-200 ms
200 ms
ECG III (55)
ROV GRID A1-B1 (55)
ROV GRID D1-C1 (55)
ROV GRID D3-C3 (55)
CS 9-10 (40)
CS 7-8 (40)
REF CS 5-6 (40)
CS 3-4 (40)
CS D-2 (40)
0.26 s
-98 ms
Resume



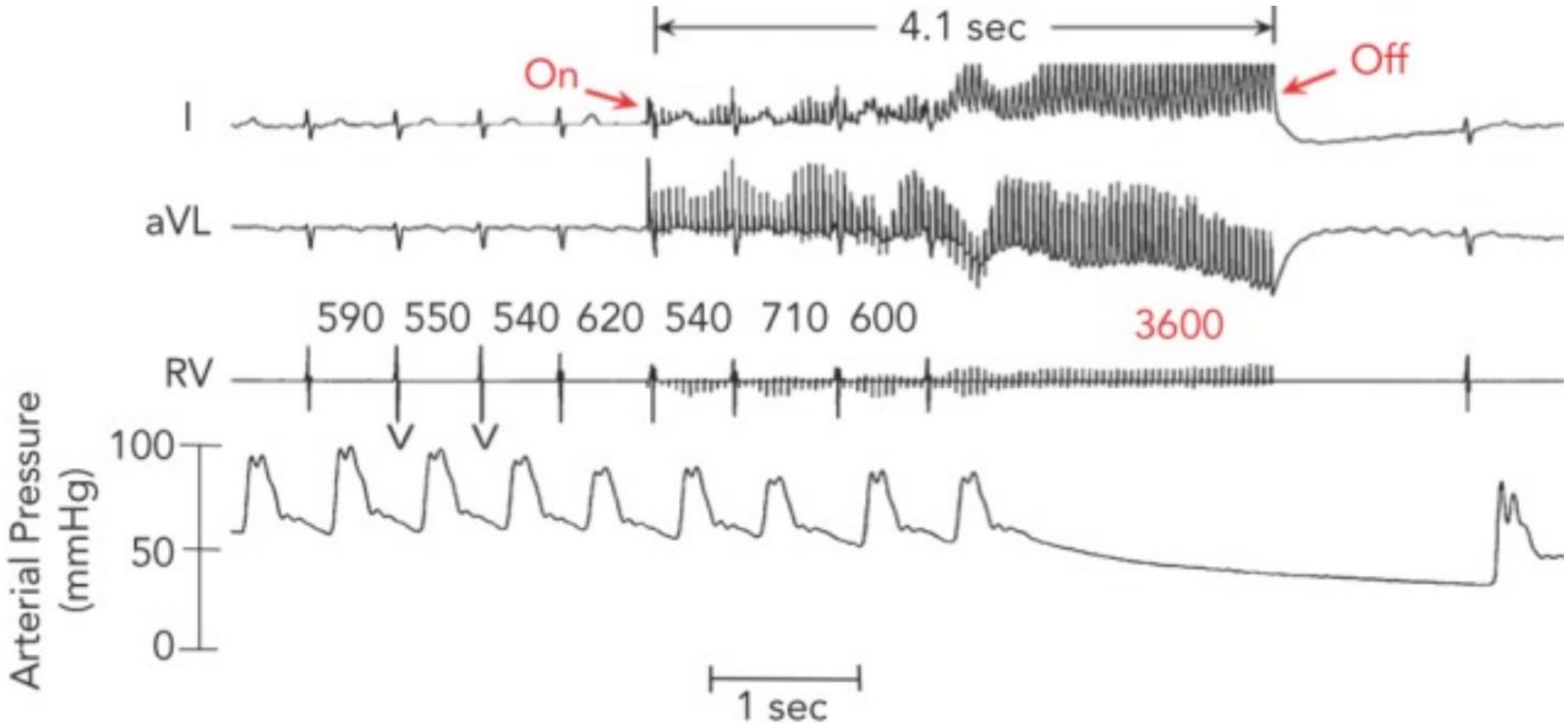
Pachon et al. Europace 2005

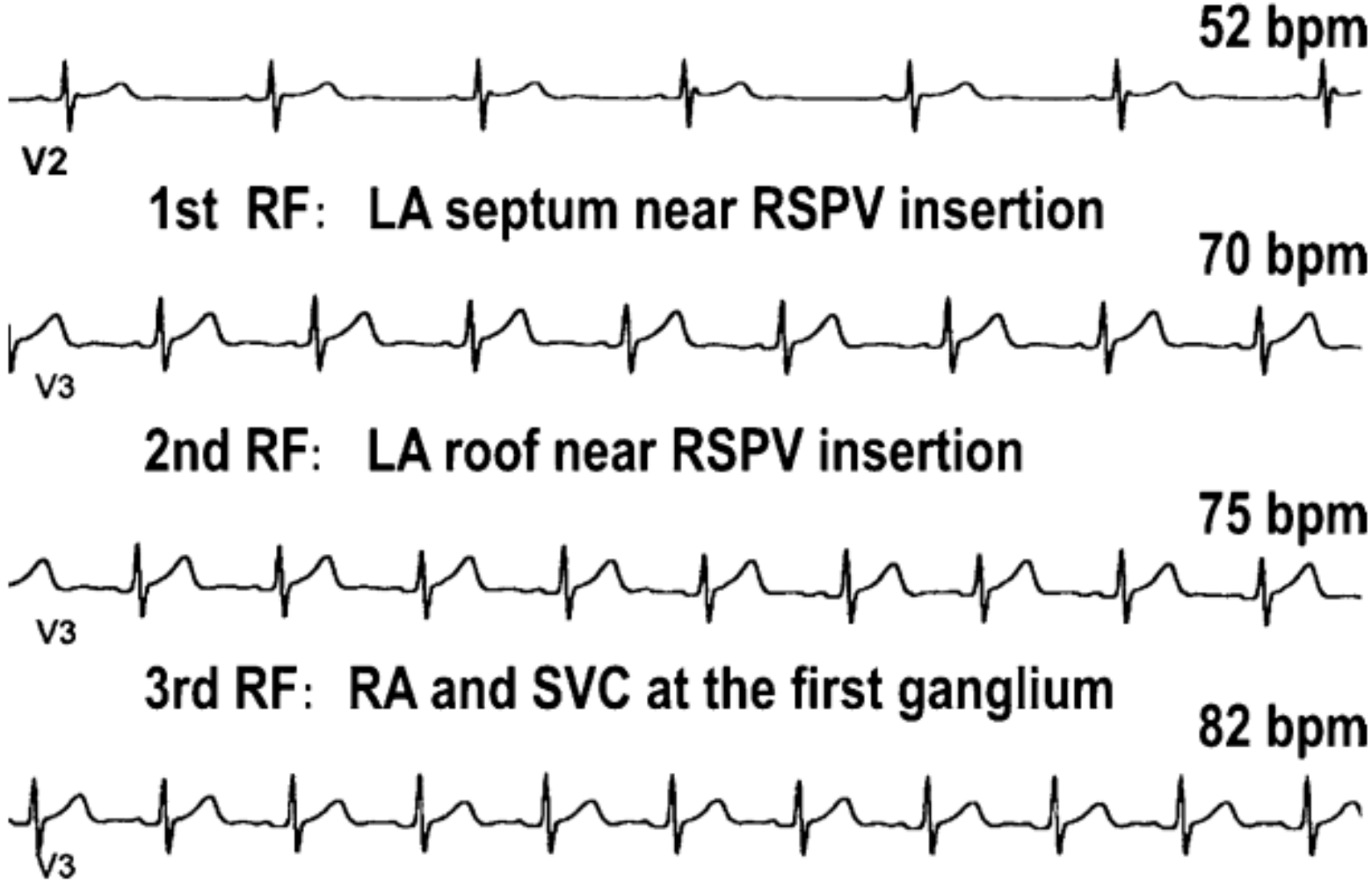
Stimulation haute fréquence

- Stimulation à haut fréquence (20Hz) pendant 2 à 5 sec sur différents sites

- Réponse vagale : asystole ventriculaire transitoire >3s, BAV 2 ou BAV3, allongement significatif des intervalles PR et RR

- Limites :
  - Inconfortable voire douloureux
  - Risque de passage en FA
  - Stimulation aspécifique des fibres sympathiques


4.1 sec
On
Off
I
aVL
590 550 540 620 540 710 600
3600
RV
Arterial Pressure
(mmHg)
100
50
0
1 sec



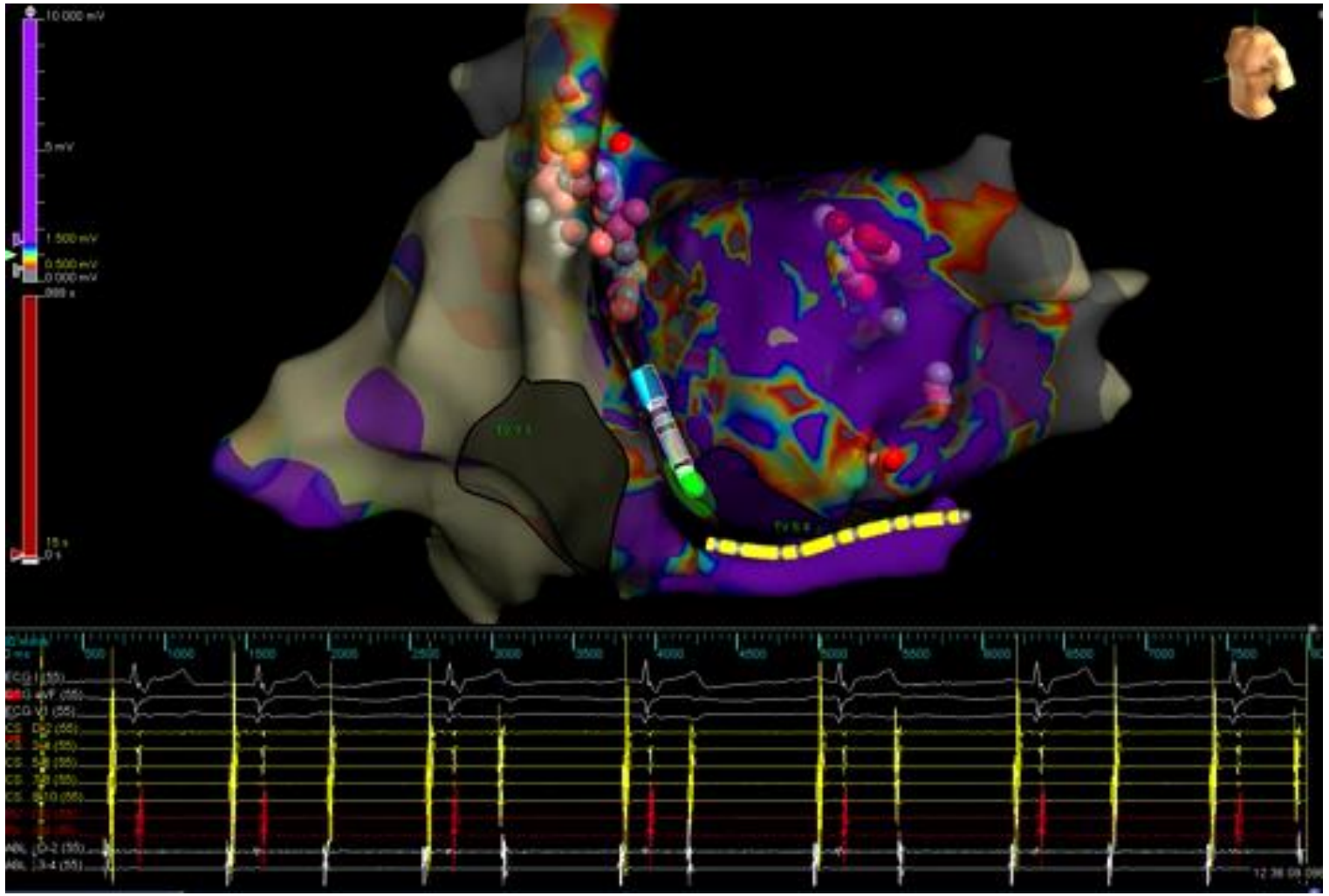
Pachon et al. Europace 2005

Table 1 Results of the *cardioneuroablation*. FU = 9.2 ± 4.1 months, A = measured at the end of the ablation procedure

Diagnostic	Pre-RF	Post-RF	*P*
Neurocardiogenic syncope 5			
Tilt-test	5/5 Positives (cardio-inhibitory)	1/5 Positive (vasodepressor)	
HRV SDNN (ms)	183 ± 42	99 ± 36 (1 month)	0.005
Syncope or dizziness	5/5	0/5 (FU)	
Functional high degree AV block 7			
Syncope or dizziness	5/7	0/7 (FU)	
AVB/Holter/24 h	High degree AVB 5/7	1 Mobitz I (sleep) 1/7 (FU)	
Episodes > 2 s/Holter	38.3 ± 56	0/7 (FU)	
Wenckebach's point (ppm)	124 ± 22	160 ± 18 (A)	0.0003
AH (ms)	87 ± 13	68 ± 18 (A)	0.004
AVRP (ms)	430 ± 83	325 ± 55 (A)	0.001
Sinus node dysfunction 13			
Bradycardia symptoms	10/13	1/13 (FU)	
Mean HR/Holter/24 h (bpm)	54 ± 7	71 ± 10 (FU)	0.0001
Minimal HR/Holter/24 h (bpm)	38.9 ± 9	50 ± 8 (FU)	0.003
Wenckebach's point (ppm)	137 ± 27	153 ± 20 (A)	0.01
Pauses >2 s/Holter/24 h	30 ± 52	None (FU)	
SNTRT (ms)	1759.6 ± 594.6	1164.8 ± 193.6 (A)	0.003
Corrected SNRT (ms)	578.9 ± 288.7	261.9 ± 97.7 (A)	0.001
HRV/24 h SDNN (ms)	183 ± 53	87 ± 13 (1 month)	0.003
Atrial fibrillation	9/13	0/13 (FU)	

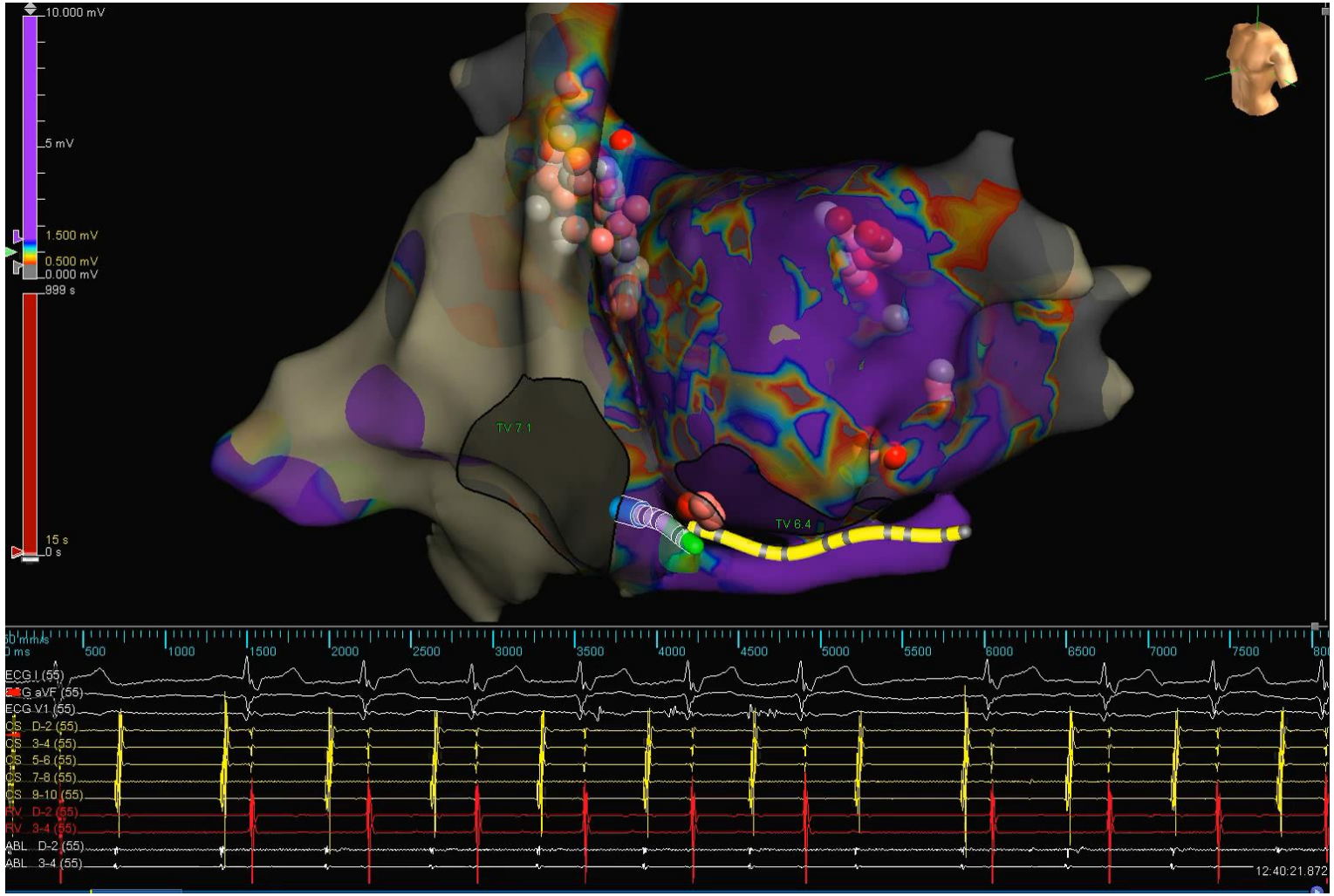
Pachon et al. Europace 2005

CNA et BAV fonctionnel



T. Aksu et al. Balkan Med Journal 2019.

CNA et BAV fonctionnel



T. Aksu et al. Balkan Med Journal 2019.

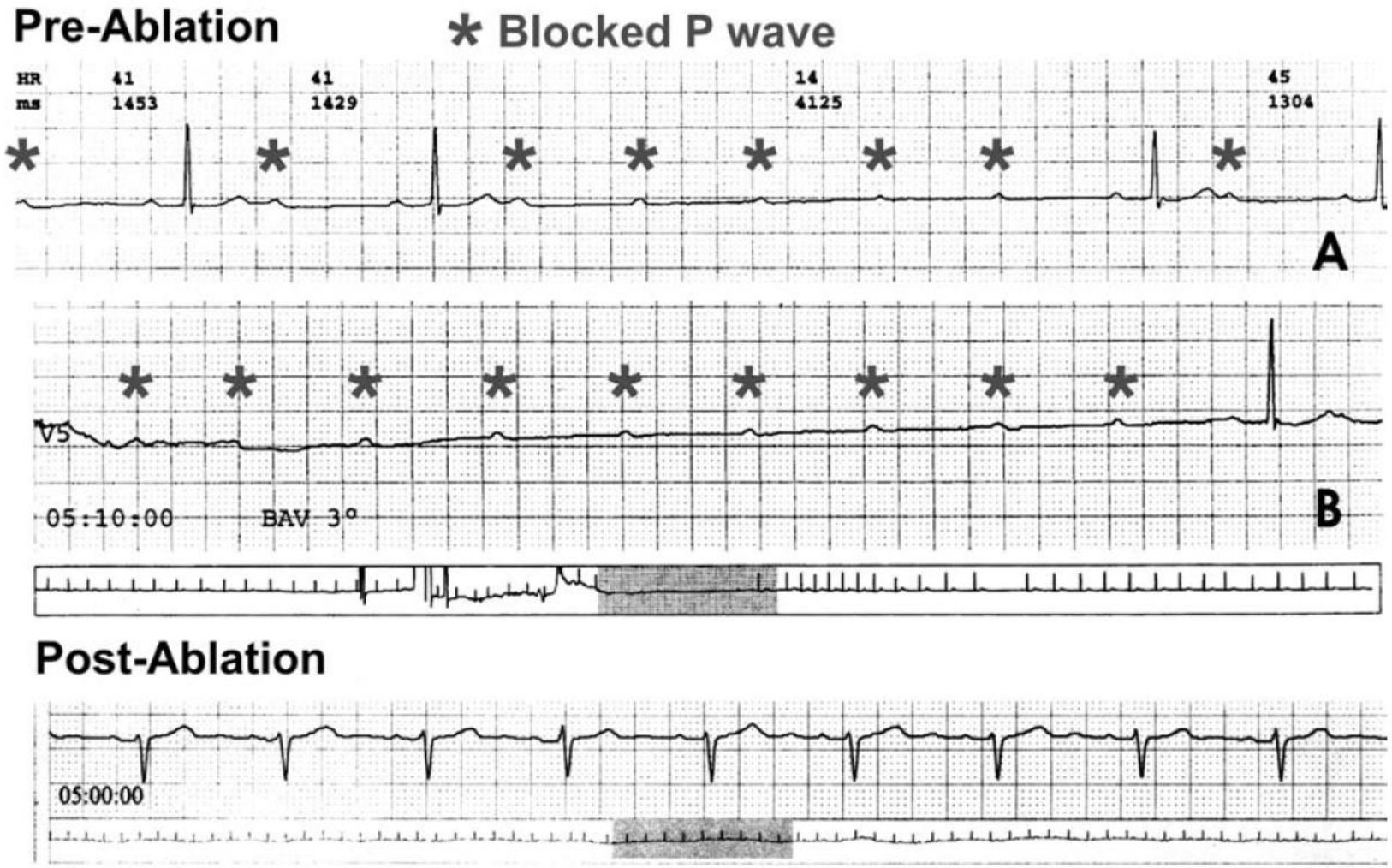
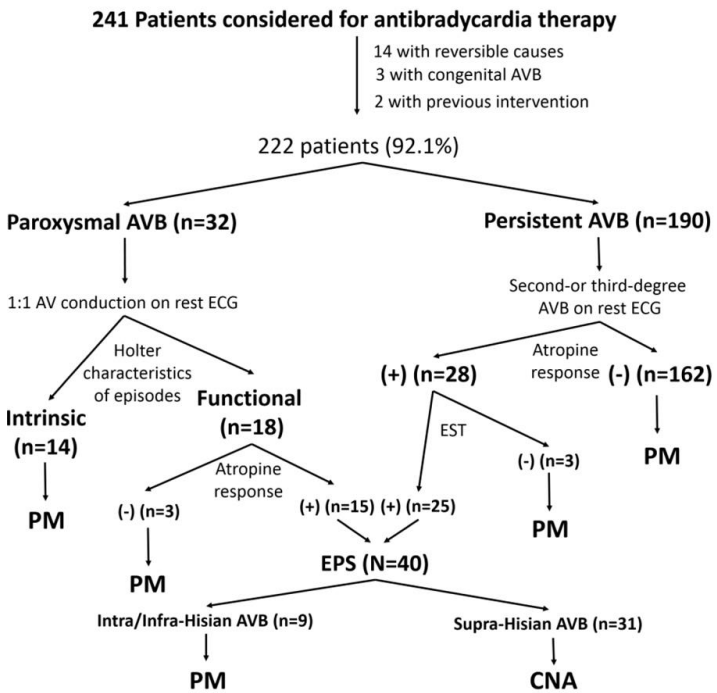
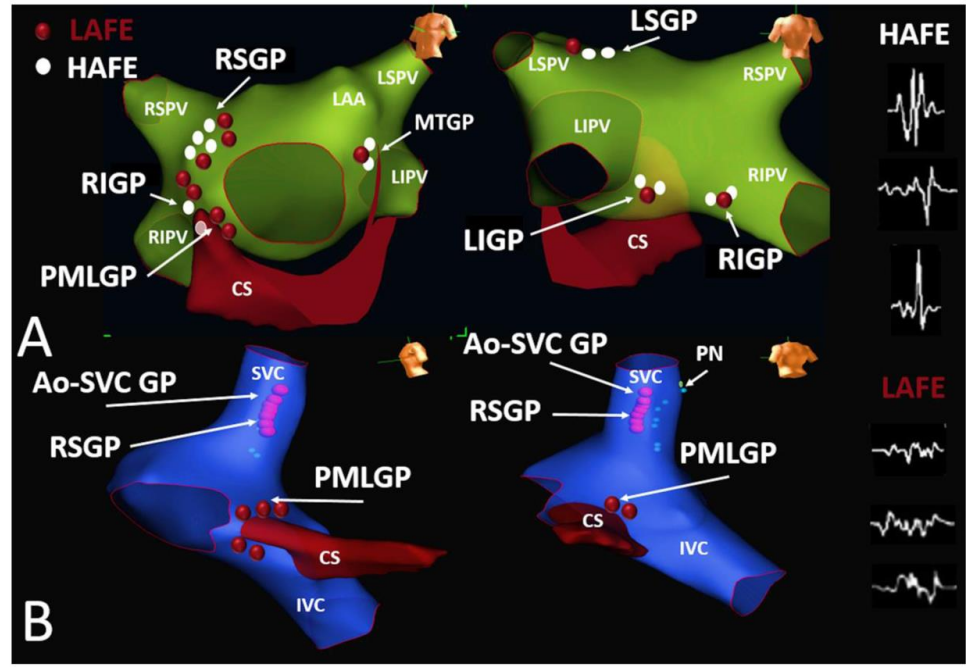


Figure 11 Holter recordings showing the 24 h lowest heart rate pre-cardioneuroablation and 2 month post-cardioneuroablation in a case of functional intermittent high degree AV block. In the pre-ablation Holter there are periods of five and nine consecutively blocked P waves. The patient was very symptomatic having syncope and dizziness being referred for pacemaker implantation. After the ablation she became asymptomatic.

Selection of patients

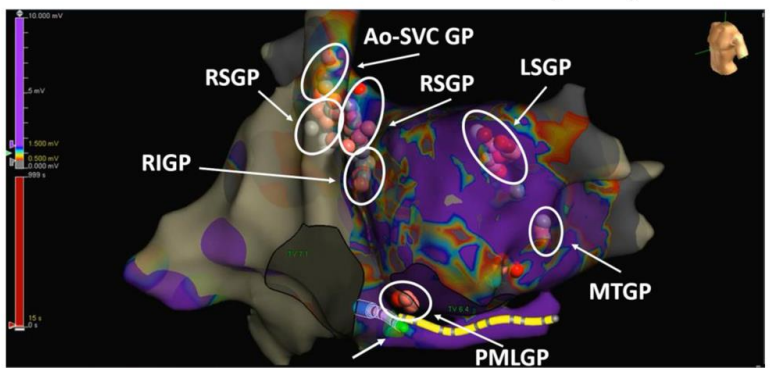


Schematic view of ganglionated plexi distribution based on electrogram characteristics

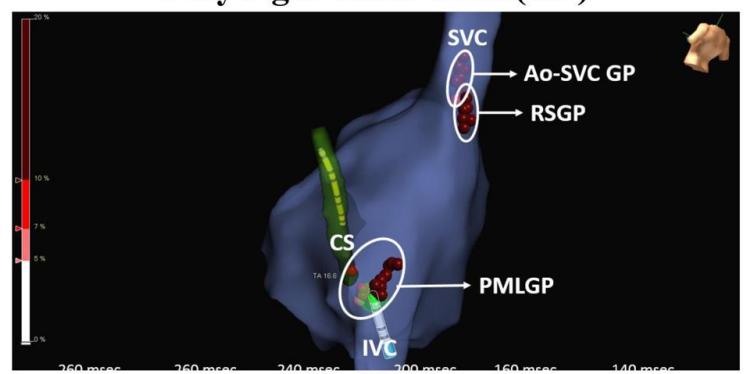


Patients underwent two different CNA approaches based on the risk of transseptal puncture

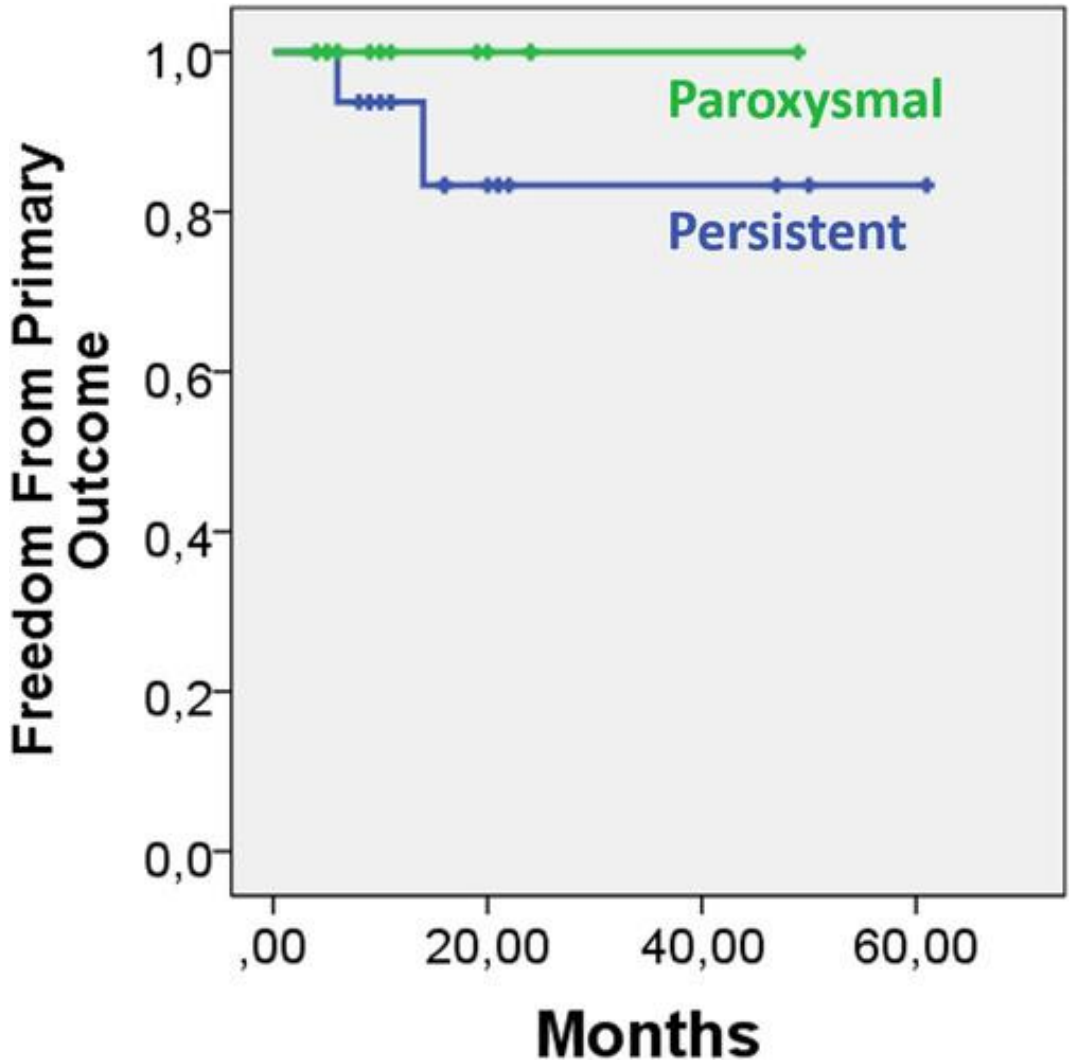
Bi-atrial or left-sided CNA (n:28)



Only right-sided CNA (n:3)



Aksu et al. 2022. Circulation 10.1161/CIRCEP.121.010018



Aksu et al. 2022. Circulation
10.1161/CIRCEP.121.010018

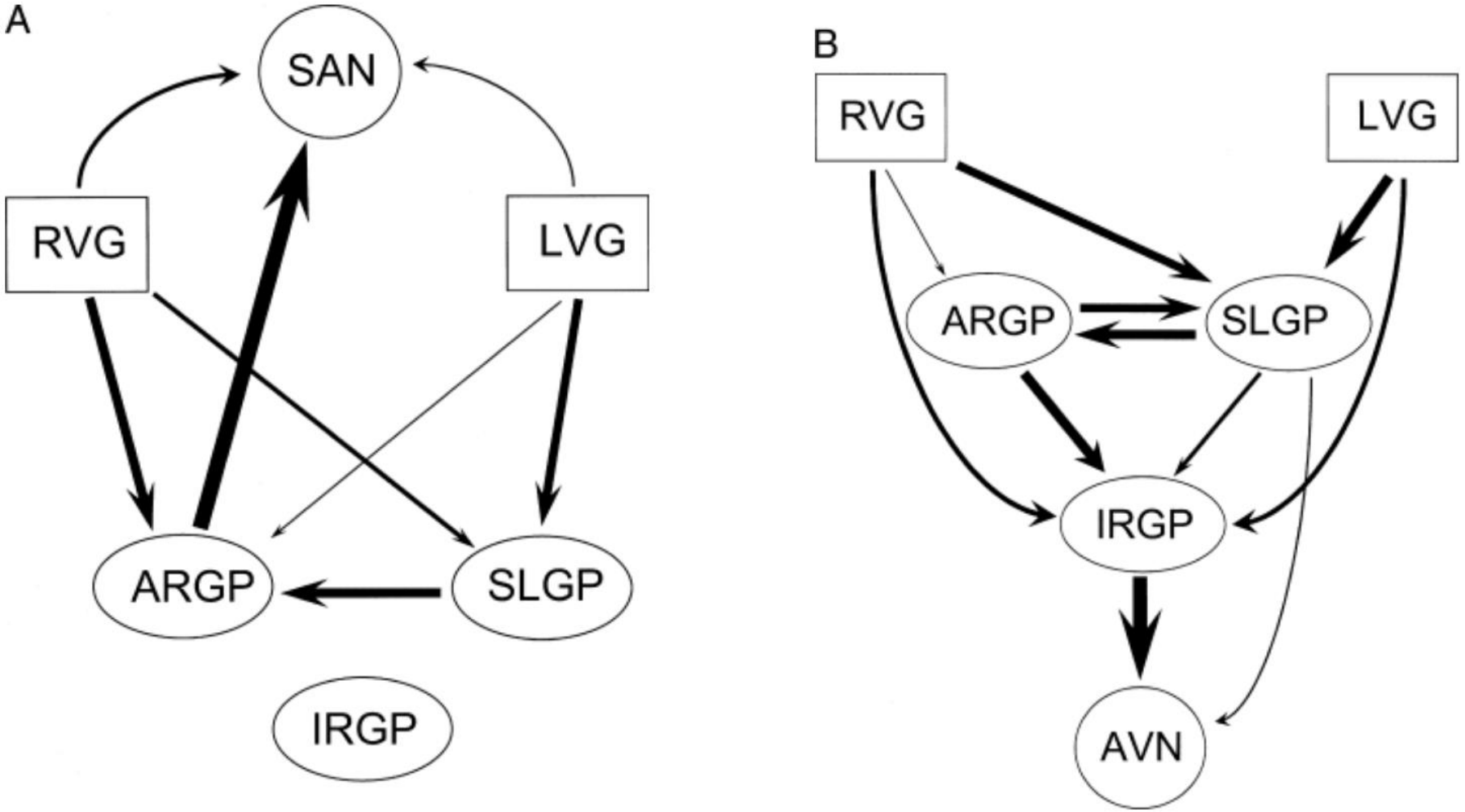
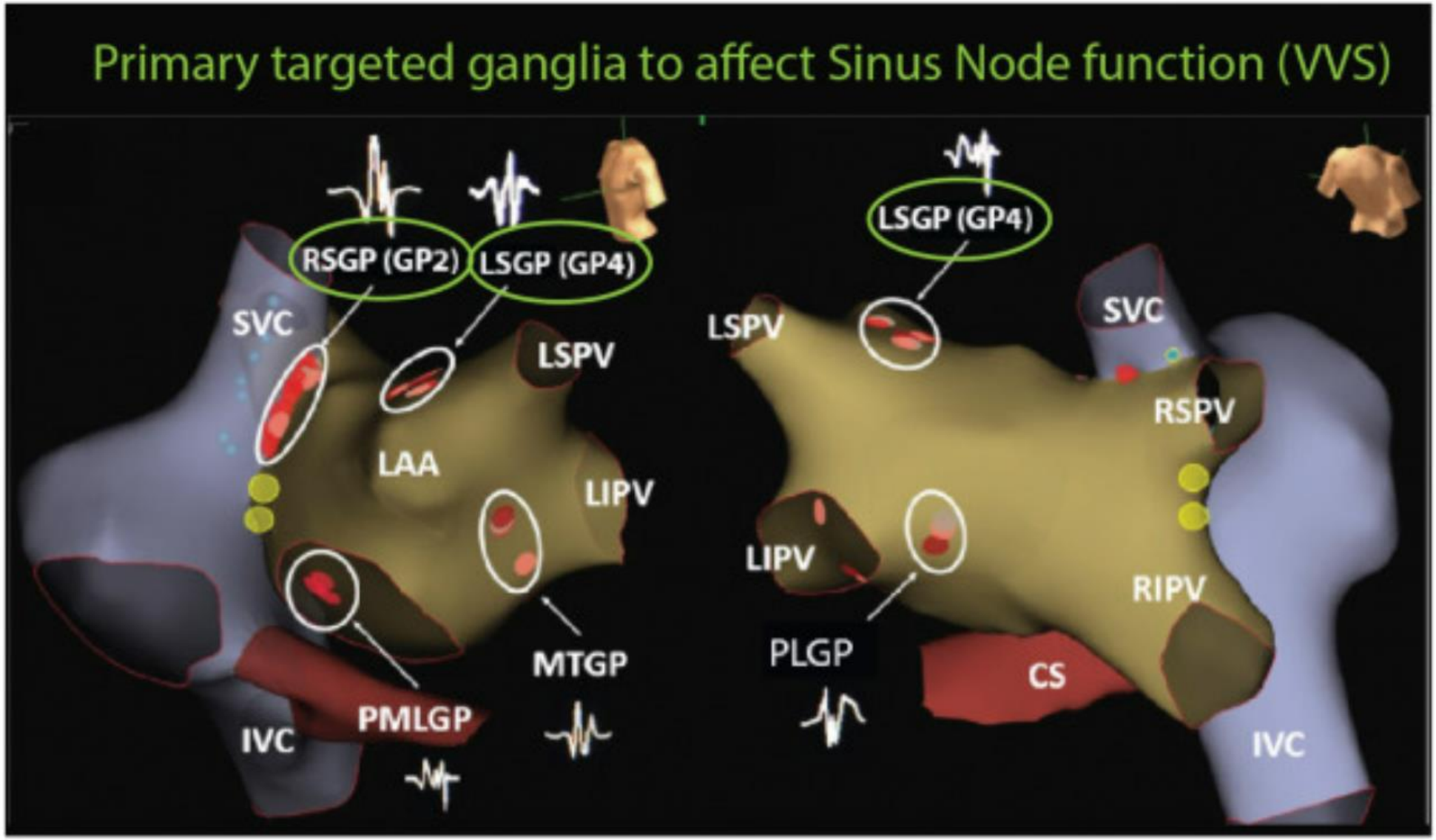


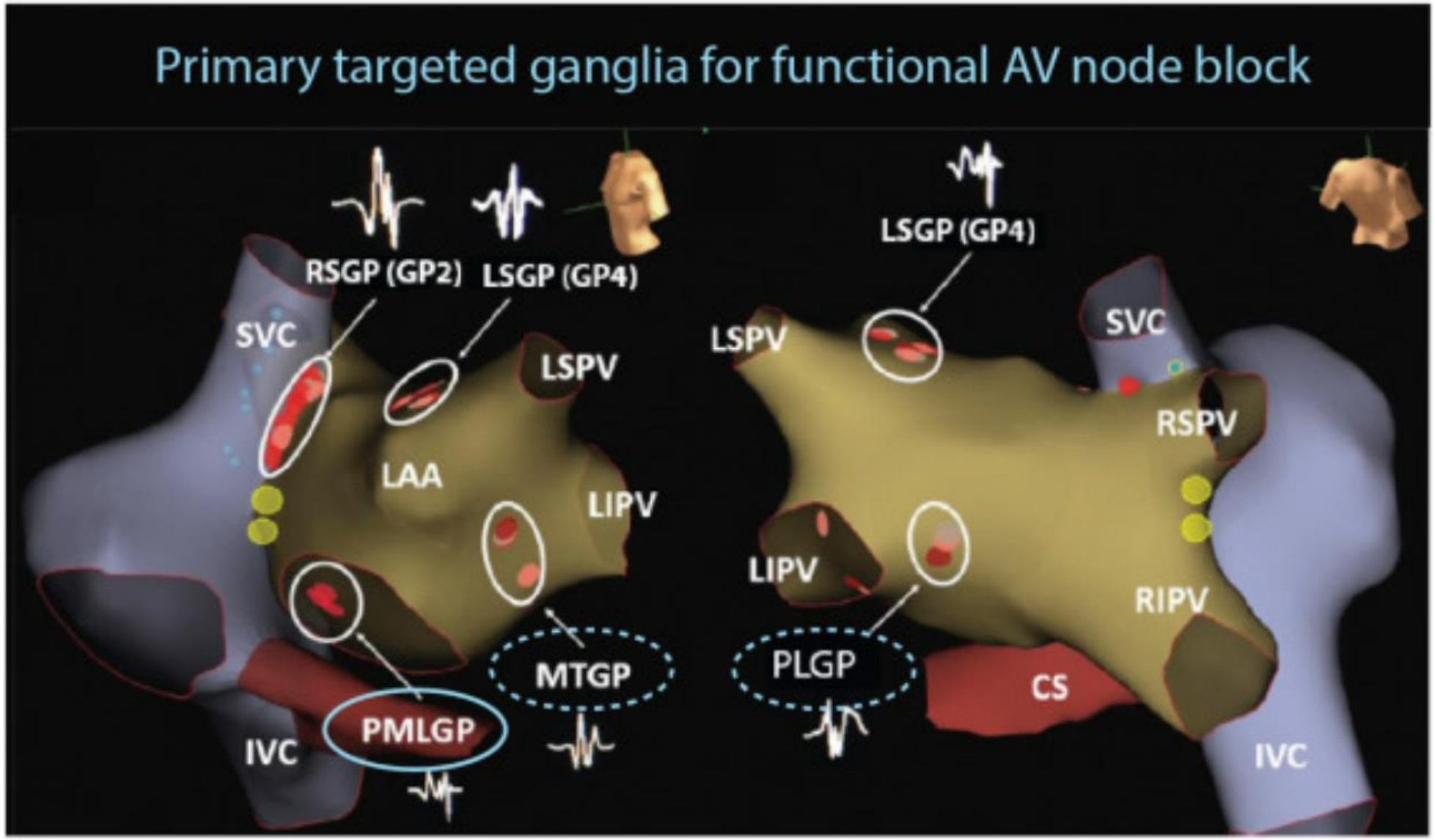
Figure 2 **Interactions Among Vagosympathetic Trunks, ARGP, IRGP, and SLGP on SAN and AVN Function**

(A) Modulation of sinus rate by vagosympathetic stimulation. **(B)** Modulation of ventricular rate during atrial fibrillation by vagosympathetic stimulation. **Thick lines** and **thin lines** indicate strong and weak regulatory effects, respectively. See text for details. AVN = atrioventricular node; LVG = left vagosympathetic trunk; RVG = right vagosympathetic trunk; SAN = sinoatrial node; other abbreviations as in Figure 1.

Yinglong Hou et al. JACC 2007



https://doi.org/10.1016/j.hroo.2023.02.007



https://doi.org/10.1016/j.hroo.2023.02.007

The benefit of cardioneuroablation to reduce syncope recurrence in vasovagal syncope patients: a case-control study

Journal of Interventional Cardiac Electrophysiology

- Etude cas-témoin : 101 patients, age moyen 39 ans, 62 % d'hommes
- 2 groupes de 19 patients (score de propension) : CNA vs traitement usuel.
- Tilt test positif avec réponse cardio-inhibitrice ou mixte.
- Suivi moyen 22 mois

Aksu et al. J Interv Card Electrophysiol. 2022

Baseline characteristics	Total	Cardioneuroablation	Conservative treatment	*p* value	Standardized mean difference
Number (%)	38	19	19		
Male gender (n, %)	24 (63)	12 (63)	12 (63)	1.000	*< 0.001*
Age (years)	39 (27–48)	38 (30–48)	40 (25–47)	0.546	0.042
Pre-enrollment syncope number	4 (3–5)	4 (3–5)	4 (3–6)	0.807	0.054
Hypertension (n, %)	6	3 (15.7)	3 (15.7)	1.000	*< 0.001*
Diabetes mellitus (n, %)	1	0 (0)	1 (5.2)	0.311	0.331
Head-up tilt test response					
VASIS type 2B response on head-up tilt test	38 (97)	19 (100)	18 (94.7)	1.000	0.333
Duration of asystole (s)	5.5 (5–8)	6 (4–8)	5 (5–8)	0.935	0.050
Usage of provocative agent (n, %)	30 (77)	15 (79)	15 (79)	1.000	*< 0.001*
Follow-up	24 (16–40)	20 (15–52)	24 (16–35)	0.226	0.239

Values are presented as IQR-25th/median/IQR-75th

VASIS, the Vasovagal Syncope International Study

Aksu et al. J Interv Card Electrophysiol. 2022

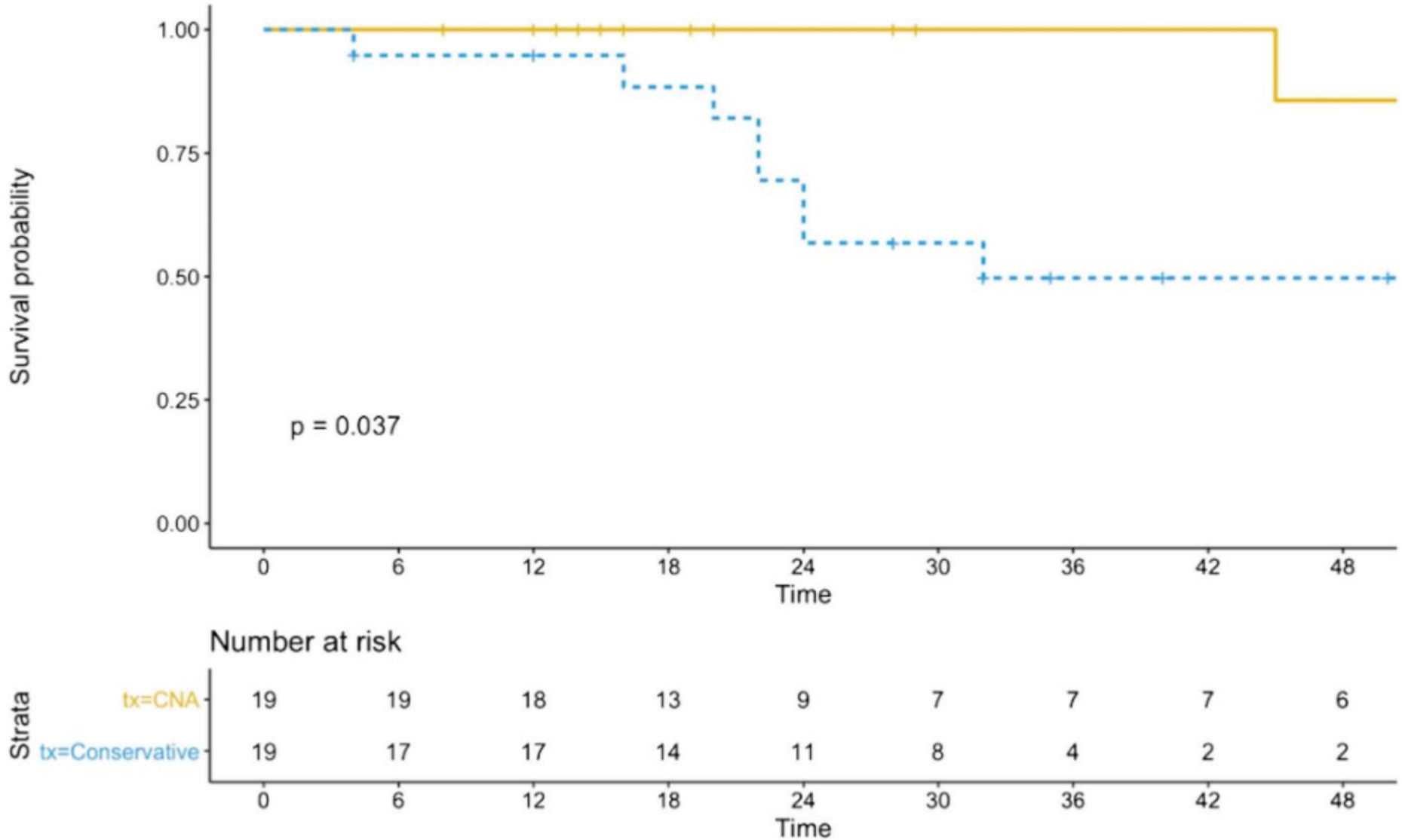


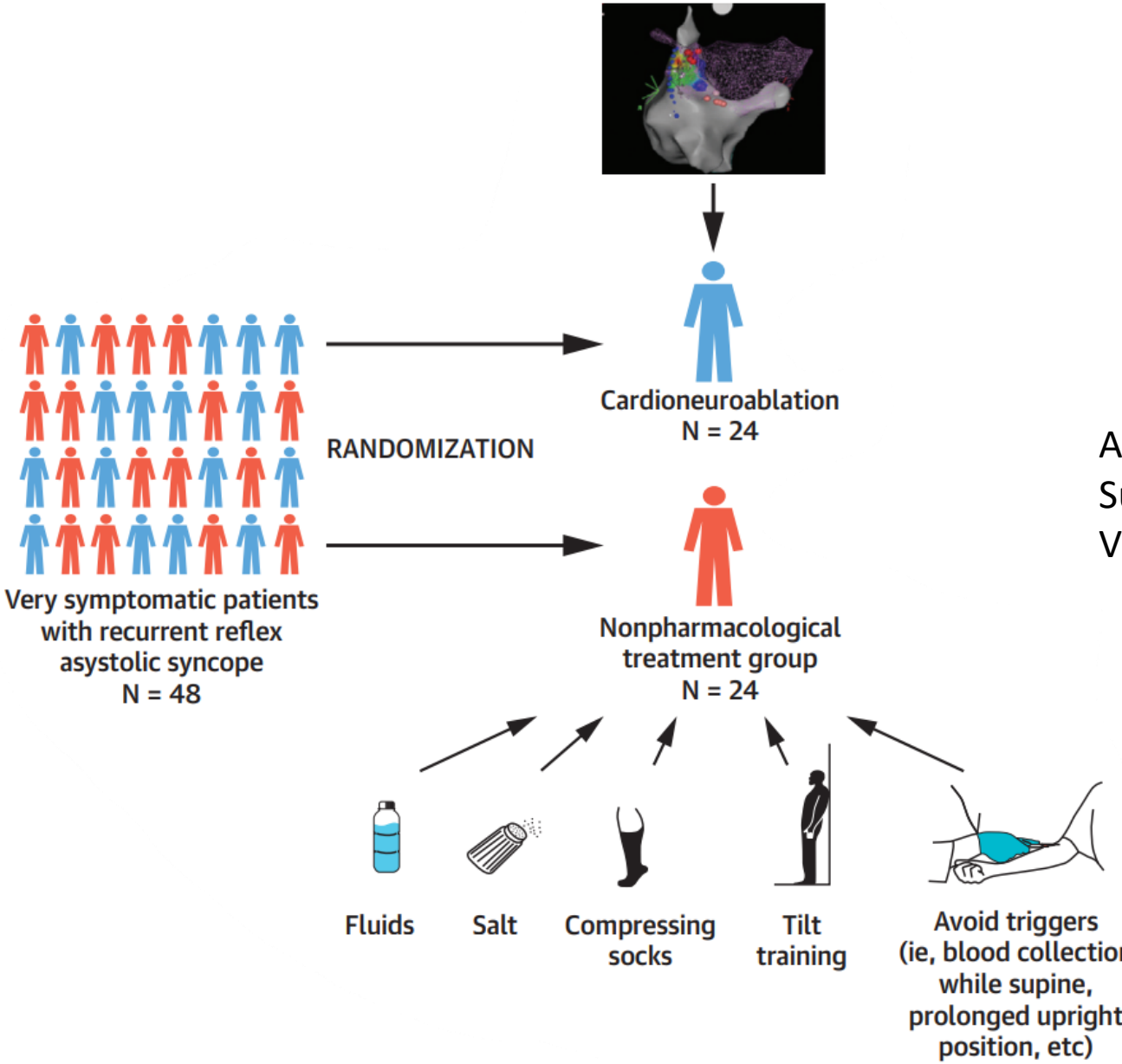
Fig. 5 The Kaplan-Meier curves for syncope-recurrence-free survival in the cardioneuroablation and conservative therapy groups. CNA, cardioneuroablation; CT, conservative therapy

Aksu et al. J Interv Card Electrophysiol. 2022

Table 1: The Major Clinical Studies of Cardioneuroablation

Study	Cases of VVS	Types of VVS	Identification of GP	Location of GP	RAGP Ablation	Endpoint of Ablation	Follow-up	Syncope Recurrence	Complications
Pachon et al. 2005[7]	5	Type 2	SA + AA	LA + RA	Yes	Elimination of potential	9 months	n=0/5	None
Pachon et al. 2011[12]	43	Type 1 and 2	SA+AA	LA + RA	Yes	Elimination of potential	45 months	n=3/43	None
Yao et al. 2012[8]	10	Type 2	HFS	LA	Yes	Elimination of VR	30 months	n=0/10	None
Sun et al. 2016[10]	57	Type 2	HFS + AA	LA	Yes	Elimination of VR	36 months	HFS: n=0/10 AA: n=5/47	None
Aksu et al. 2016[24]	8	Type 1 and 2	SA + AA + HFS	LA + RA	Yes	Elimination of VR/ elimination of potential	11 months	n=0/8	None
Debruyne et al. 2018[20]	12	Type 1 and 2	AA*	RA	Yes	P–P interval shorten/ total ablation time	6 months	n=3/12	None
Aksu et al. 2019[25]	20	Type 1 and 2	SA + AA + HFS	LA + RA	Yes	Elimination of VR	12 months	n=2/20	None
Hu et al. 2019[11]	115	Type 1, 2 and 3	AA + HFS	LA	Yes	Elimination of VR	21 months	n=4/115	None
Aksu et al. 2020[26]	25	Type 1 and 2	FEGM + AA + HFS	LA + RA	Yes	Elimination of potential	9 months	n=0/25	None
Aksu et al. 2021[27]	46	Type 1 and 2	FEGM + AA + HFS	LA + RA	Yes	Elimination of potential	15 months	n=2/46	None
Debruyne et al. 2021[28]	31	Type 1 and 2	AA*	RA	Yes	Increase of HR/total ablation time	12 months	n=9/31	None
Hu et al. 2021[29]	28	Type 1	AA + HFS	LA	Yes	Elimination of VR/ elimination of potential	16 months	n=0/28	None
Calo et al. 2021[30]	18	Type 1 and 2	AA	RA	Yes	Elimination of potential	34 months	n=3/18	None
Aksu et al. 2022[22]	51	Type 2	AA + HFS	LA + RA	Yes	Elimination of VR/ elimination of potential	22 months	n=3/51	None
Piotrowski et al. 2022[23]	24	Type 2	FEGM + AA	LA + RA	Yes	Increase of HR/ elimination of potential	24 months	n=2/24	None

**CT-guided anatomical approach. AA = anatomical approach; FEGM = fractionated electrogram mapping; GP = ganglionated plexi; HFS = high-frequency stimulation; HR = heart rate; P–P interval = time between successive P waves; LA = left atrium; RA = right atrium; RAGP = right anterior GP; SA = spectral analysis; VR = vagal response; VVS = vasovagal syncope; type of VVS is based on the VASIS classification.*



Age moyen 38 ans
Suivi 2 ans
VVS cardio inhibitrice 23/24

Piotrowski R, et al. J Am Coll Cardiol EP. 2023;9(1):85-95.

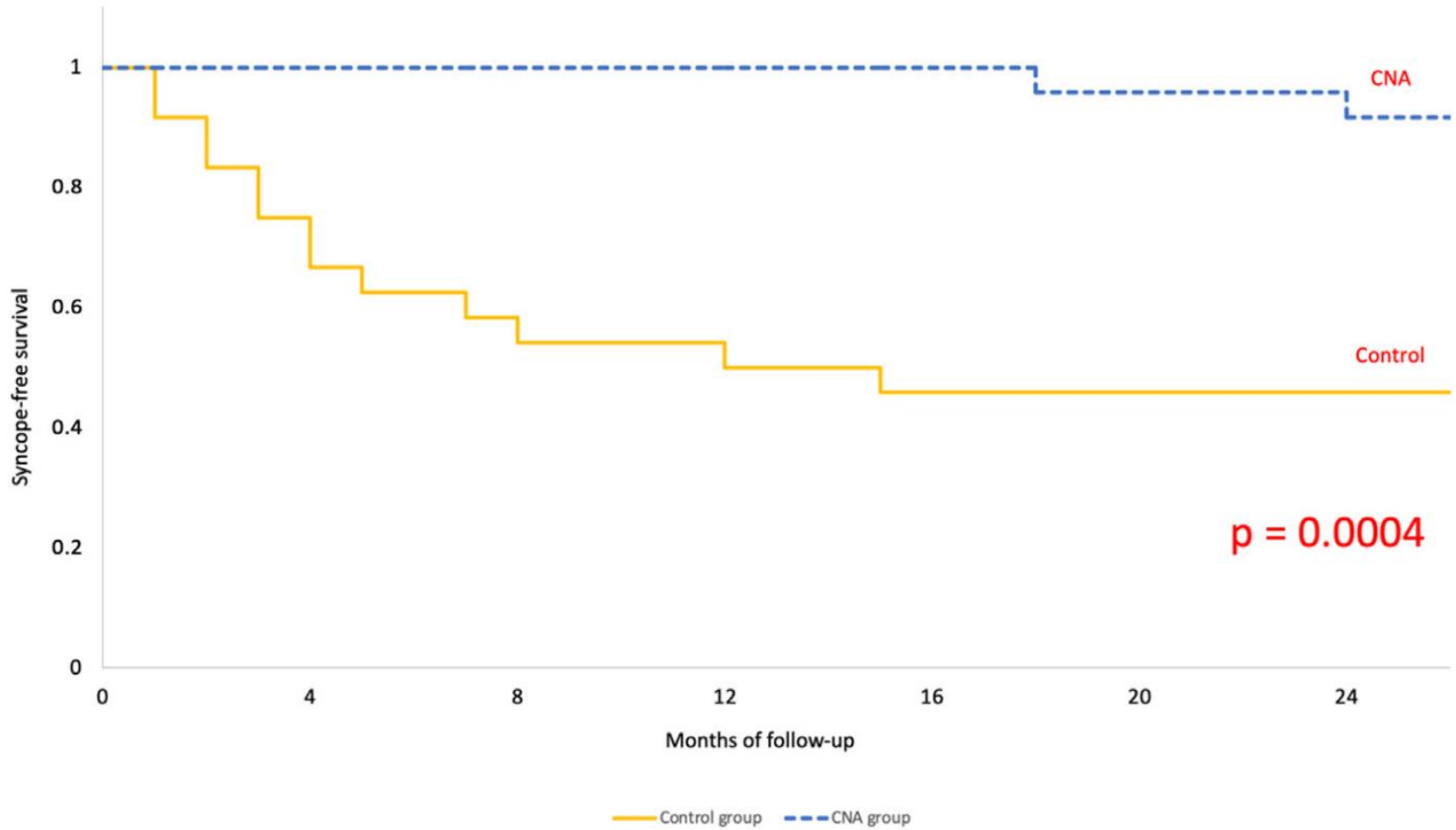
TABLE 2 CNA: Procedural Details (N = 24)

Total procedure duration—skin to skin, (min)	143 ± 25
Total RF applications	32 ± 7
Total time of RF application, s	939 ± 338
Total time of X-ray, s	359 ± 163
Total dose X-ray, mGy	359 ± 54
Total dose X-ray, Gy · cm^2	5.13 ± 5.95
Additional RF applications	
LSGP	1
LIGP	1
Ao-SVC GP	2

Values are mean ± SD or n.

Ao-SVC GP = aorta-superior vena cava ganglionated plexi; LIGP = left inferior ganglionated plexi; LSGP = left superior ganglionated plexi; RF = radiofrequency; other abbreviations as in Table 1.

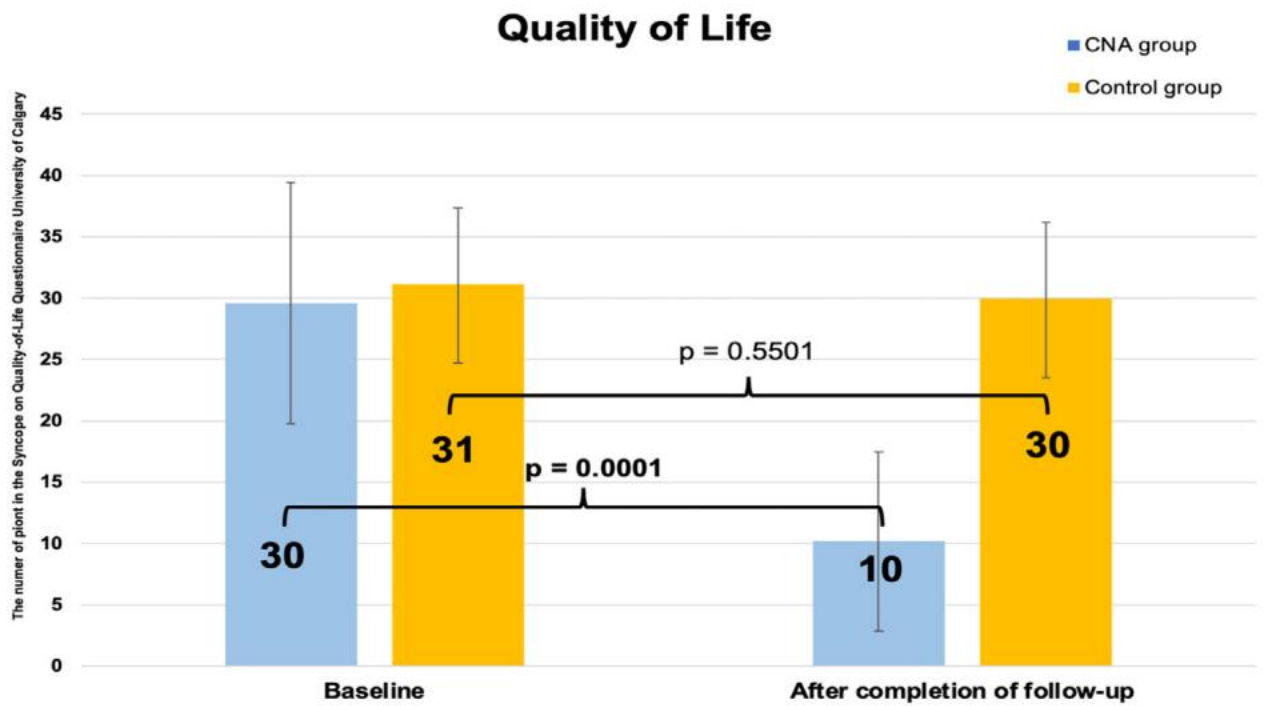
FIGURE 2 **Kaplan-Meier Curves for First Recurrence of Syncope**



The Kaplan-Meier curves for the first recurrence of syncope during 2-year follow-up in the cardioneuroablation (CNA) versus control groups.

Piotrowski R, et al. J Am Coll Cardiol EP. 2023;9(1):85-95.

FIGURE 4 QoL at Baseline and After Follow-Up



Comparison of quality of life (QoL) in the cardioneuroablation (CNA) group **(blue bars)** and in the control group **(orange bars)** before CNA/start of nonpharmacologic treatment and after the completion of follow-up.

Piotrowski R, et al. J Am Coll Cardiol EP. 2023;9(1):85-95.

TABLE 5 Comparison Holter ECG and HRV Parameters Recorded at Baseline and 3, 12, and 24 Months After CNA

	Baseline	After 3 Months	After 12 Months	After 24 Months	*P* Value[a]	*P* Value[b]	*P* Value[c]
Mean SR, beats/min	67 ± 10	83 ± 8	79 ± 9	80 ± 10	0.0001	0.0002	0.0003
Minimum SR, beats/min	46 ± 9	65 ± 10	60 ± 10	57 ± 9	0.0001	0.0001	0.0005
Maximum SR, beats/min	127 ± 19	126 ± 19	124 ± 14	128 ± 17	0.9801	0.6078	0.8160
24-h SDNN, ms	141 ± 42	75 ± 21	88 ± 26	107 ± 31	0.0001	0.0001	0051
Index SDANN, ms	115 ± 35	70 ± 20	79 ± 25	95 ± 26	0.0001	0.0004	0.0442
Index SDNN, ms	70 ± 25	22 ± 9	32 ± 13	35 ± 12	0.0001	0.0001	0.0001
rMSSD, ms	39 ± 17	12 ± 5	15 ± 7	15 ± 6	0.0001	0.0001	0.0001
pNN50, %	16 ± 13	0.5 ± 1.6	1.3 ± 2.3	1.2 ± 2.0	0.0001	0.0001	0.0001

Values are mean ± SD. *P* values = differences between SR and HRV values in Holter ECG performed before CNA and after [a]3 months, [b]12 months, and [c]24 months.

ECG = electrocardiogram; HRV = heart rate variability; pNN50 = proportion of NN50 divided by total number of normal to normal intervals, when NN50 = successive normal to normal intervals differing more than 50 ms; rMSSD = root mean square of successive differences; SDANN = SD of 5-minute average normal to normal intervals; SDNN = SD of normal to normal intervals; other abbreviations as in Tables 1 and 3.

CNA vs PM?

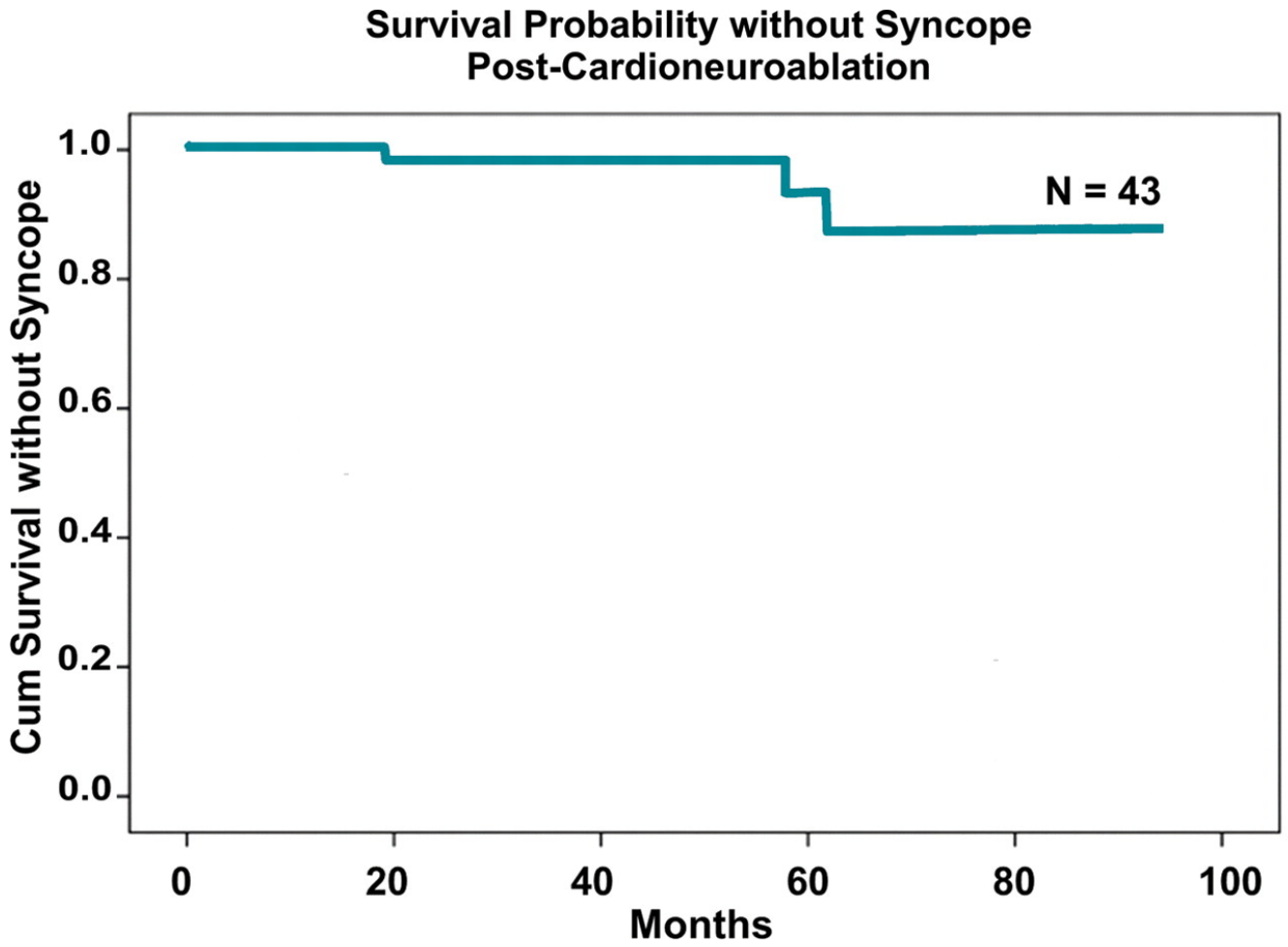
- 162 patients VVS cardioinhibitrice : 61 CNA – 101 PM (dont 24 MICRA)
- Syncopes fréquentes : 6.7 ± 3.9/an. Age moyen 36 ans
- À 1 an, récidive de syncope = 3% CNA vs 11% PM (p=0,09)

R. Gopinathannair et al. JICE 2022

Lacunes

- Hétérogénéité des stratégies d’ablation, localisation de GP, end point
- Effet placebo?
- Données limitées, nécessité d’essais contrôlés randomisés
- Effet à long terme?

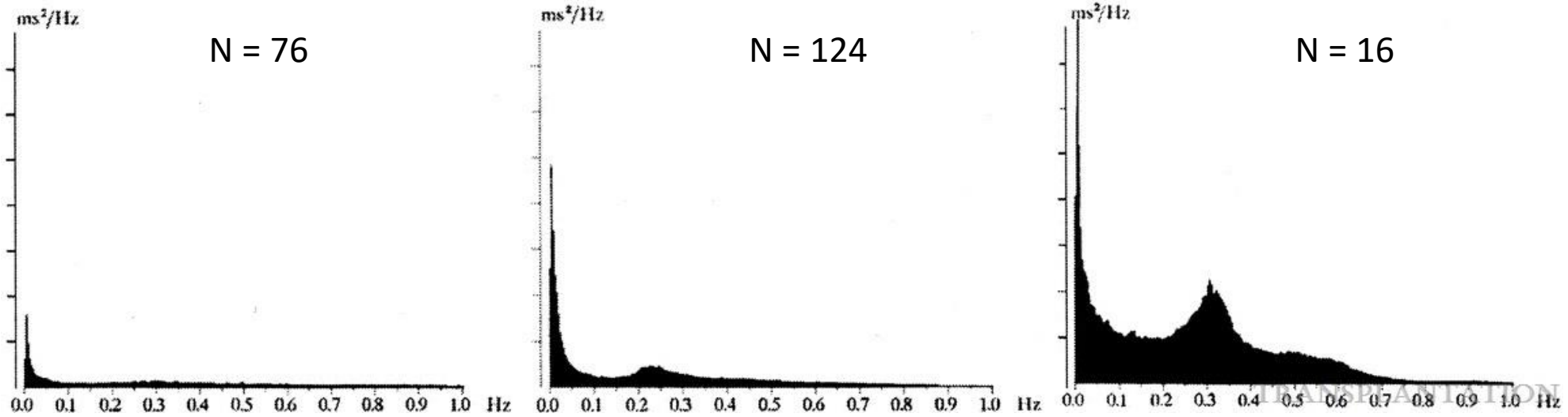
Effet à long terme ?



Suivi moyen 45 mois (11–91.5 mois)

Pachon et al. Europace 2011

Different Evolutions in Heart Rate Variability after Heart Transplantation: 10-Year Follow-Up



Beckers et al. Transplantation 2004

TABLE 2. Comparison of the three subgroups

	Flat spectrum (n=76)				Small component (n=124)				Large component (n=16)			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
24-hour variables												
HR (bpm)	86	11	54	113	82	10	50	113	80	14	49	123
pNN50 (ms)	1	2	0	22	2[a]	3	0	34	5[a,b]	8	0	37
rMSSD (ms)	13	8	6	89	17[a]	11	6	104	25[a,b]	21	8	152
SD (ms)	69	31	21	204	77[a]	26	27	185	95[a,b]	34	11	163
Total power (ms)	59.0	58.4	6.0	421.0	120.6[a]	109.9	10.0	700.0	333.5[a,b]	465.1	13.0	3611.0
LF power (ms^2)	11.9	11.3	1.0	76.0	27.2[a]	25.8	1.0	160.0	75.7[a,b]	126.9	1.0	1001.0
HF power (ms^2)	13.7	15.6	2.0	154.0	24.3[a]	24.0	3.0	240.0	75.2[a,b]	186.1	5.0	1484.0
LF/HF	1.0	0.8	0.1	5.5	1.5[a]	1.7	0.1	14.7	2.1[a]	2.1	0.0	10.2
Daytime variables												
HR (bpm)	91	11	61	124	88	11	54	122	87	15	52	124
pNN50 (ms)	1	3	0	35	2[a]	4	0	35	3[a,b]	7	0	40
rMSSD (ms)	12	6	0	60	16[a]	12	0	114	20[a,b]	17	7	126
SD (ms)	43	15	15	101	51[a]	19	18	140	63[a,b]	27	19	139
Total power (ms)	58.3	61.8	7.0	480.0	122.1[a]	136.0	10.0	1350.0	266.8[a,b]	337.7	12.0	2480.0
LF power (ms^2)	11.2	12.8	1.0	154.0	26.4[a]	27.8	1.0	227.0	62.8[a,b]	103.5	2.0	762.0
HF power (ms^2)	12.5	14.4	2.0	146.0	23.7[a]	26.5	2.0	209.0	50.6[a,b]	97.6	4.0	718.0
LF/HF	1.0	0.8	0.1	5.4	1.5[a]	1.6	0.1	9.6	2.1[a]	2.1	0.0	9.4
Nighttime variables												
HR (bpm)	80	11	45	120	76	10	43	116	73	13	44	121
pNN50 (ms)	1	3	0	34	2[a]	4	0	36	8[a,b]	13	0	62
rMSSD (ms)	12	6	0	61	16[a]	10	1	113	30[a,b]	29	8	192
SD (ms)	41	21	11	204	48[a]	20	14	123	64[a,b]	28	14	180
Total power (ms)	61.4	64.8	4.0	485.0	126.5[a]	127.2	10.0	1030.0	507.4[a,b]	795.1	15.0	5960.0
LF power (ms^2)	13.1	12.5	1.0	88.0	30.1[a]	30.6	1.0	203.0	108.4[a,b]	196.4	1.0	1541.0
HF power (ms^2)	14.8	14.5	2.0	186.0	27.7[a]	32.7	2.0	412.0	140.2[a,b]	365.3	6.0	2857.0
LF/HF	1.1	1.1	0.1	8.5	1.6[a]	1.9	0.1	18.6	2.3[a]	2.7	0.0	13.8

Values are the mean over 10 years.

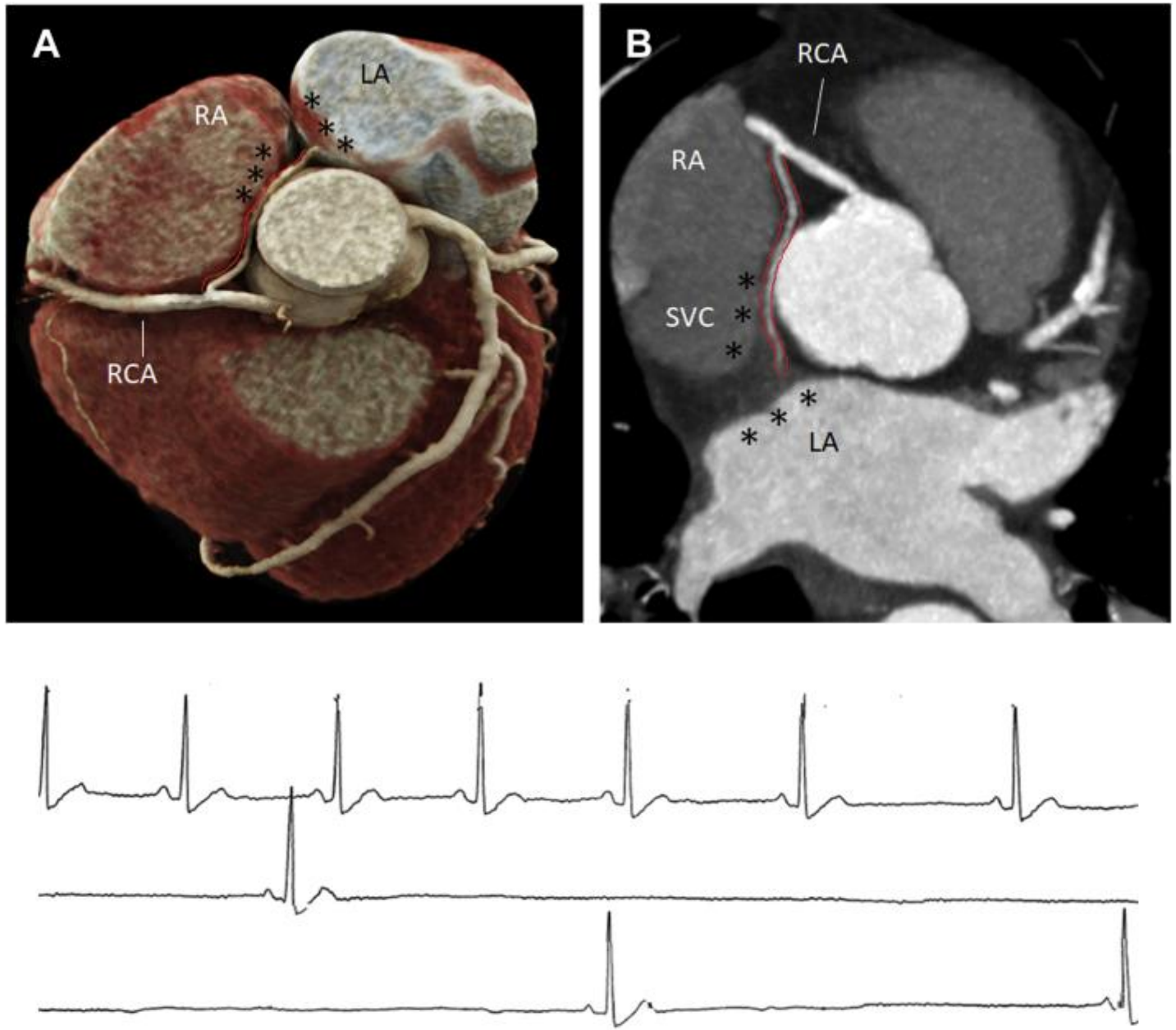
[a] $P<0.001$ compared with "flat spectrum" group; [b] $P<0.001$ compared with "small component" group (Tukey's post hoc analysis for multiple groups).

pNN50, percentage of intervals differing more than 50 ms from the previous interval; rMSSD, square root of the mean of sums of the squares of differences between adjacent intervals; SD, standard deviation.

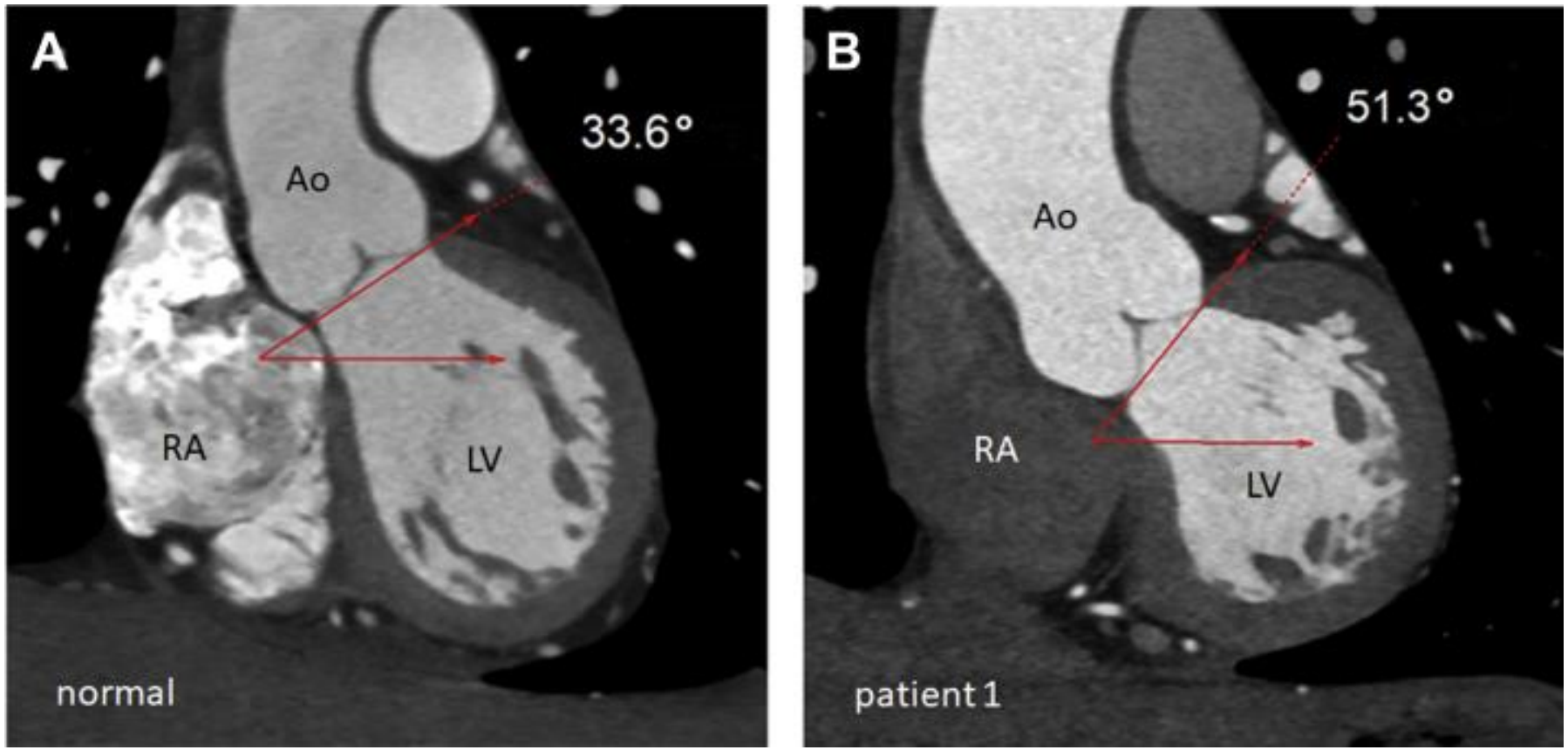
Beckers et al. Transplantation 2004

Sécurité

- Risques liés au geste en lui-même (abord fémoral, ponction transseptale etc..)
- Tachycardie sinusale inappropriée
- Effet pro arythmogène?
- 2 cases report d’occlusion artère nœud sinusal (1 récupération complète, une dysfonction sinusale persistante avec implantation de PM, 55 ans)

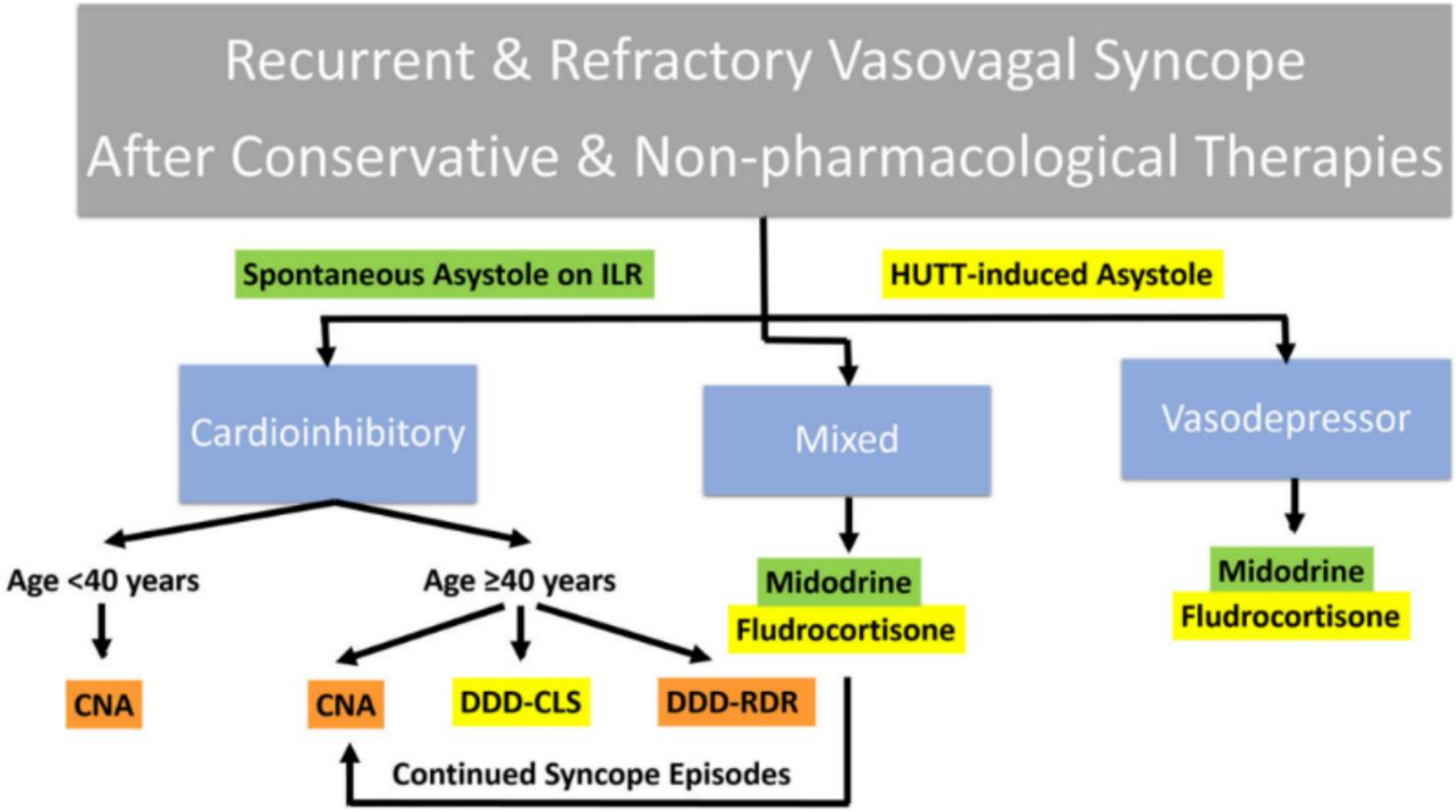


Scanavacca et al. JACC case report 2022



Scanavacca et al. JACC case report 2022

Indications *potentielles*



T. AKSU et al. Journal of cardiovascular electrophysiology, 2022

Cas de Mme G. 37 ans

- Syncopes avec prodromes vagaux depuis plusieurs années, parfois traumatiques. « Peur d'un accident »
- 2 à 3 syncopes/an, plusieurs lipothymie/mois
- Cœur « sain »
- Holter implantable dans le cadre du bilan devant une syncope traumatique

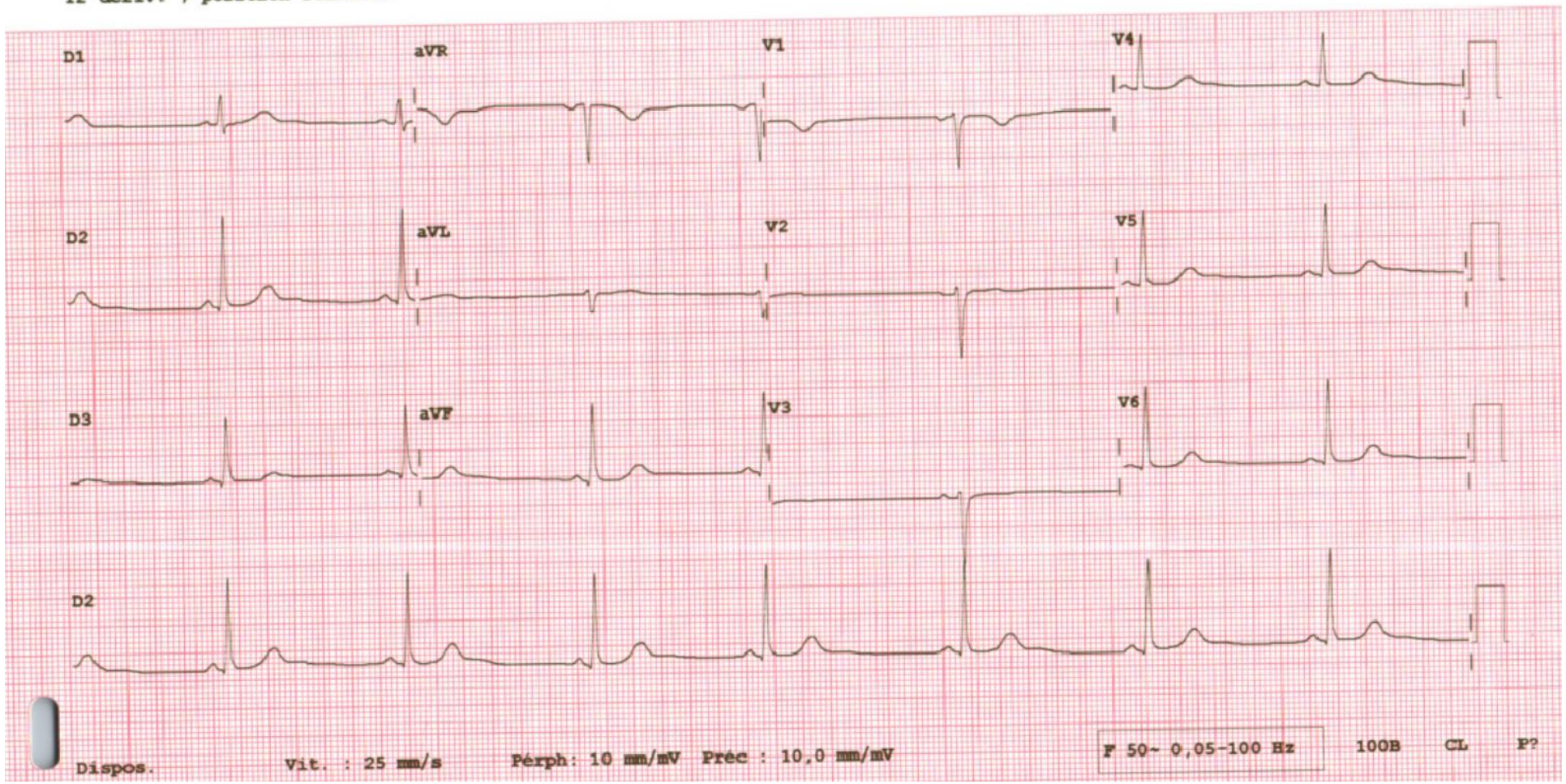
0.1 mV
400 ms
VS 1440 VS 1410 VS 1390 VS 1280 VS 1360 VS 1250 VS
09:13:30
0.1 mV
400 ms
VS 1320 VS 1330 VS 1170 VS 1230 VS 1300 VS 1670 VS 1590 VS
09:13:40
0.1 mV
400 ms
VS 1720 >2000 VS >2000
09:13:50
0.1 mV
400 ms
AD >2000 VS >2000 VS
Pause Détecté
09:14:00
0.1 mV
400 ms
VS 1730 >2000 VS 1620 VS 1640 VS

FC	46
RR	1304
PR	130
QRSD	101
QT	474
QTc	415

--AXES--

P	74
QRS	74
T	41

12 dériv. ; position standard

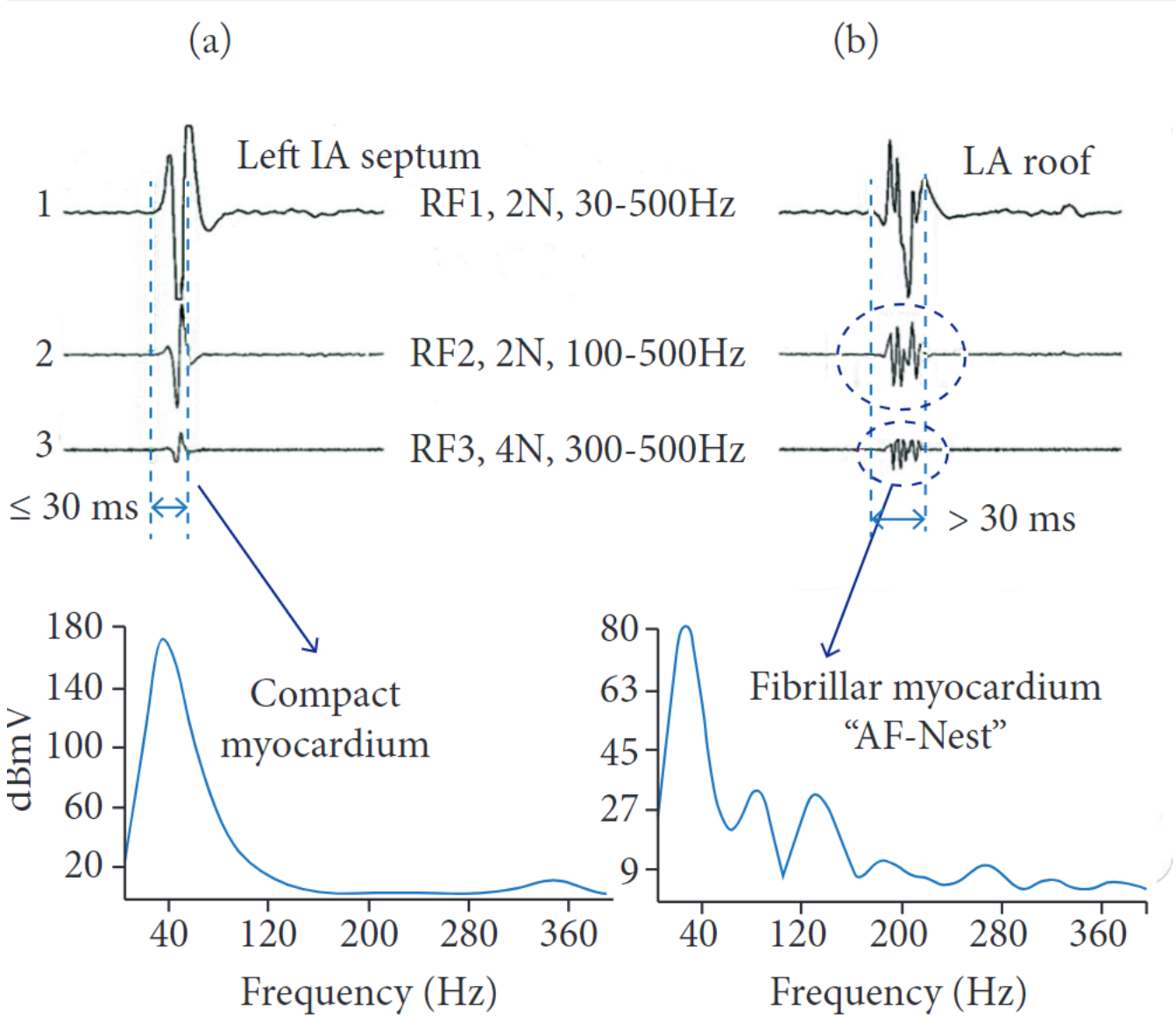


CNA – juillet 2023

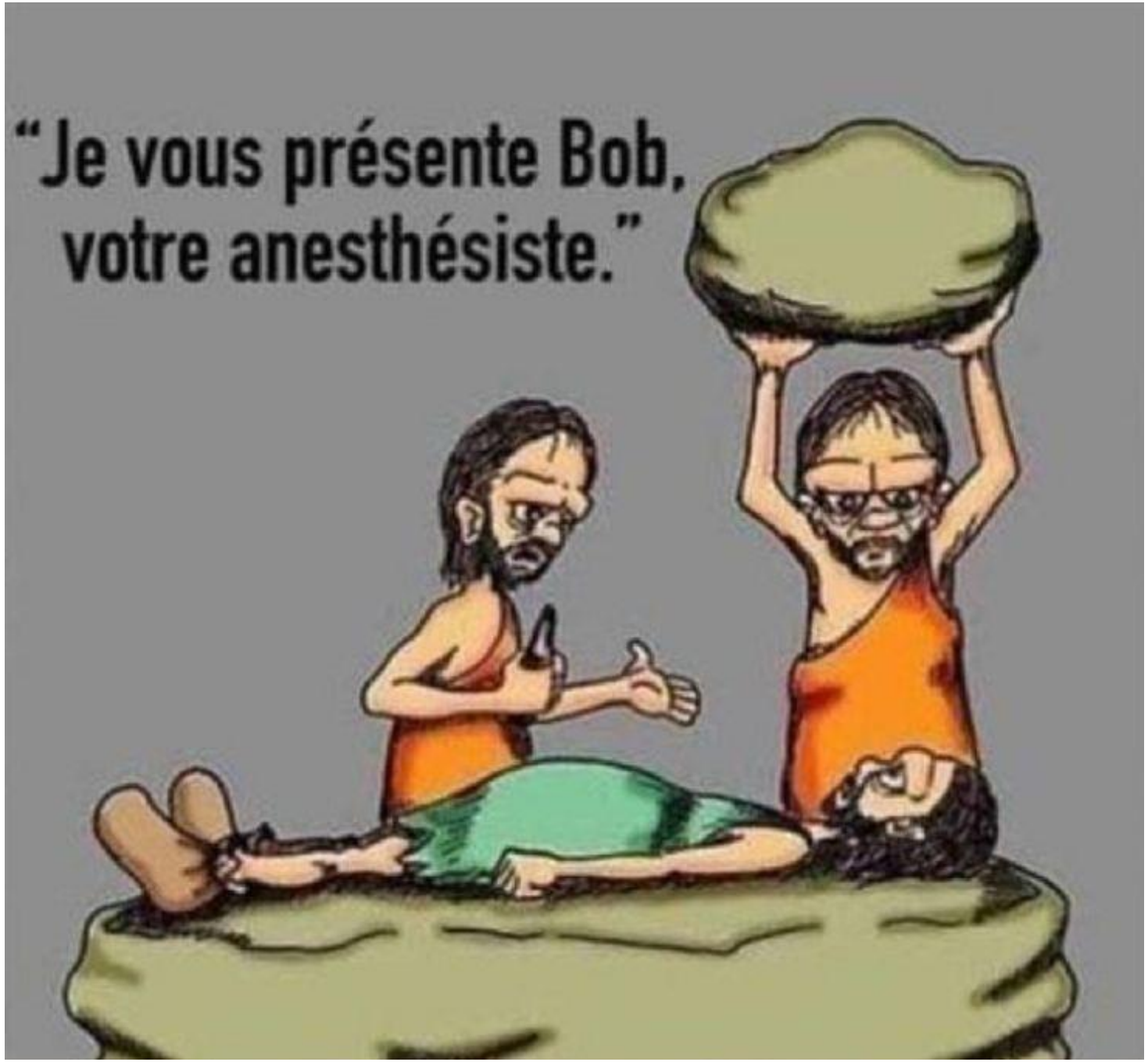
- Procédure sous AG
- Ensite X™ Voxel Mode
- Baie Claris™
- *Cathéters*:
  - Octopolaire Inquiry ™
  - Advisor HD Grid ™
  - TactiCath SE ™ DF

Déroulement de la procédure

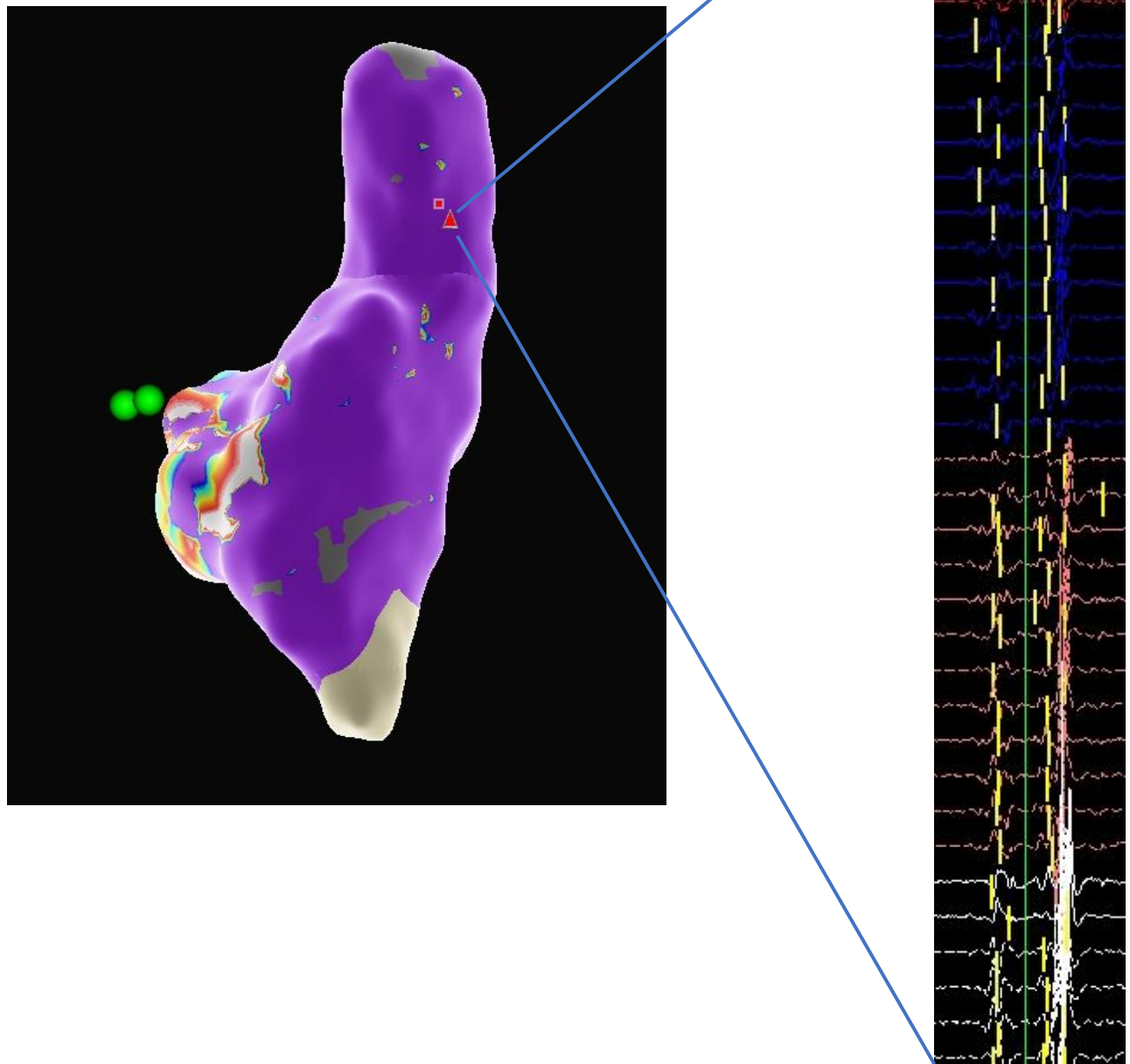
1. Modélisation de l'OD puis de l'OG
2. Cartographie de la fragmentation du signal en rythme sinusal
3. Identification et évaluation des EGMs fractionnés (filtre 200-500 Hz)
4. Ablation des cibles identifiées (30W-45°)

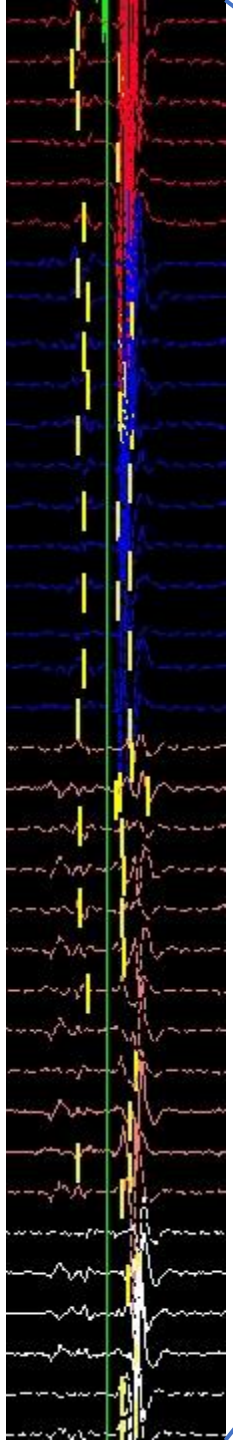


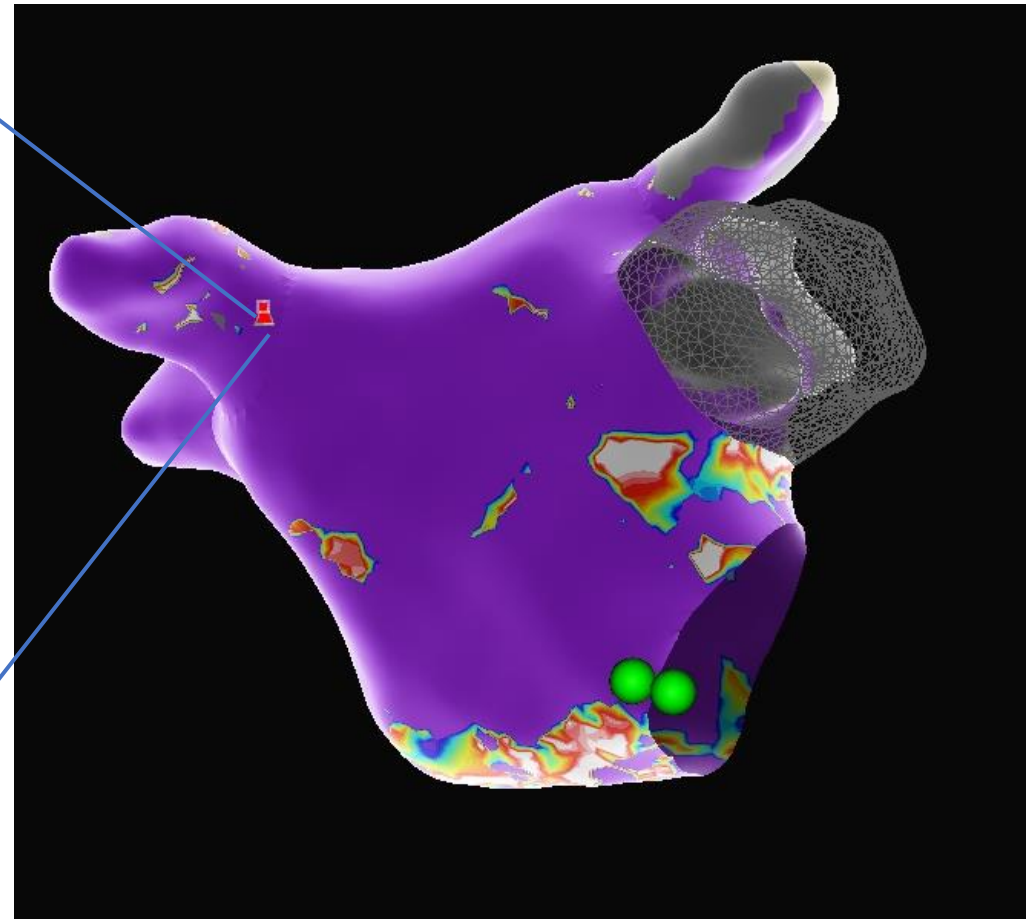
Pachon et al. Europace 2005

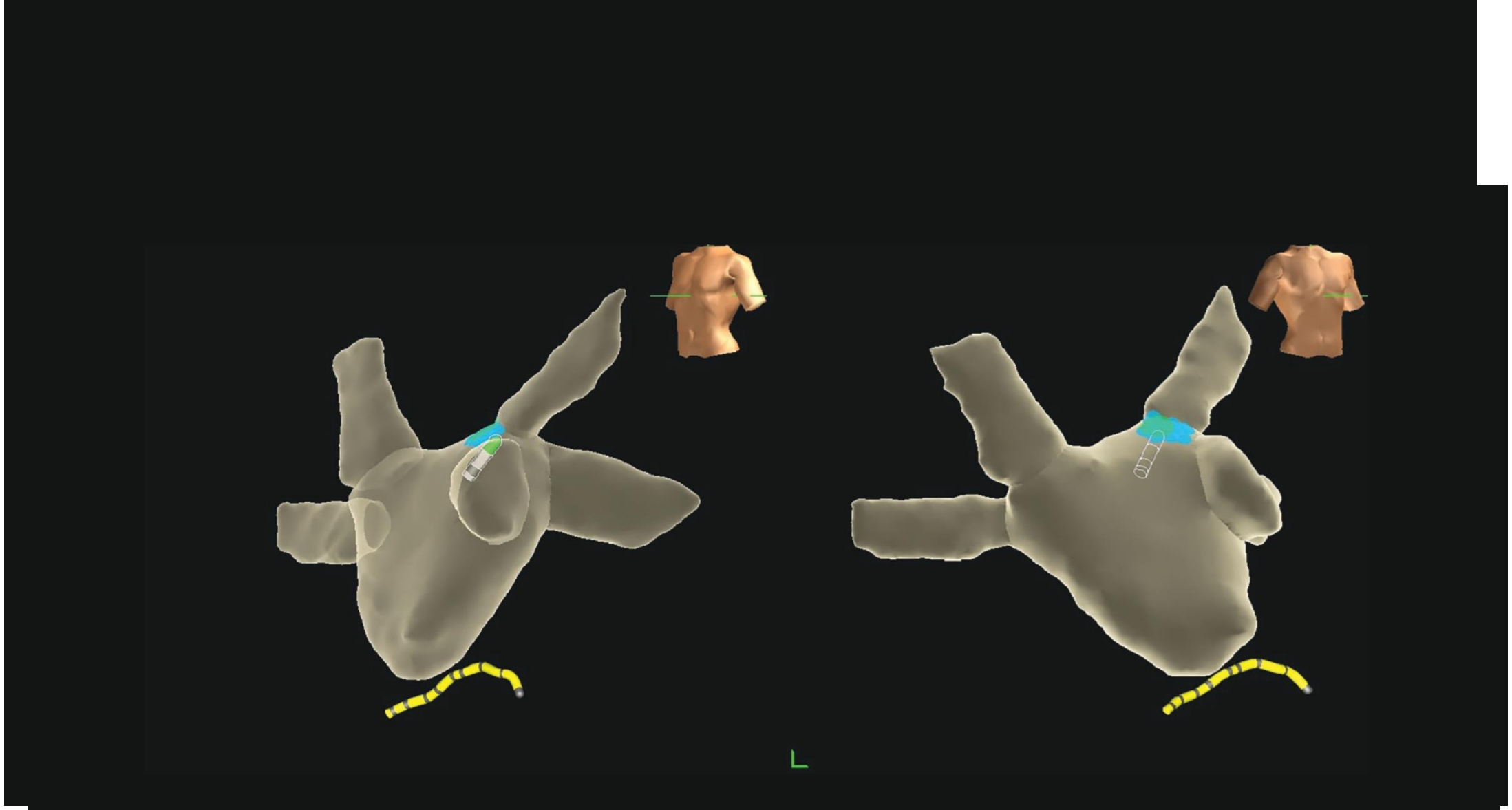

“Je vous présente Bob,
votre anesthésiste.”

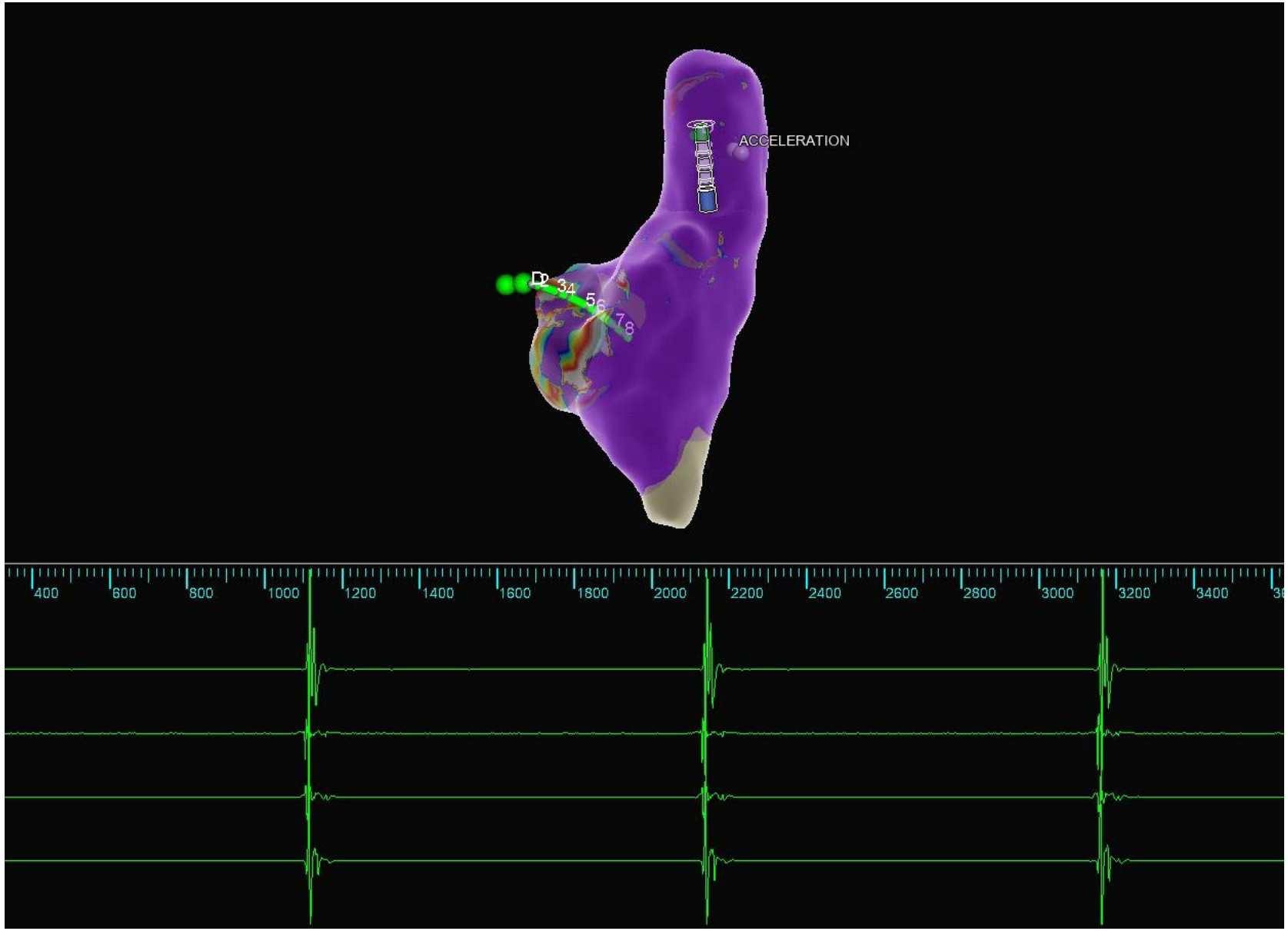

A FEW
MOMENTS
LATER...

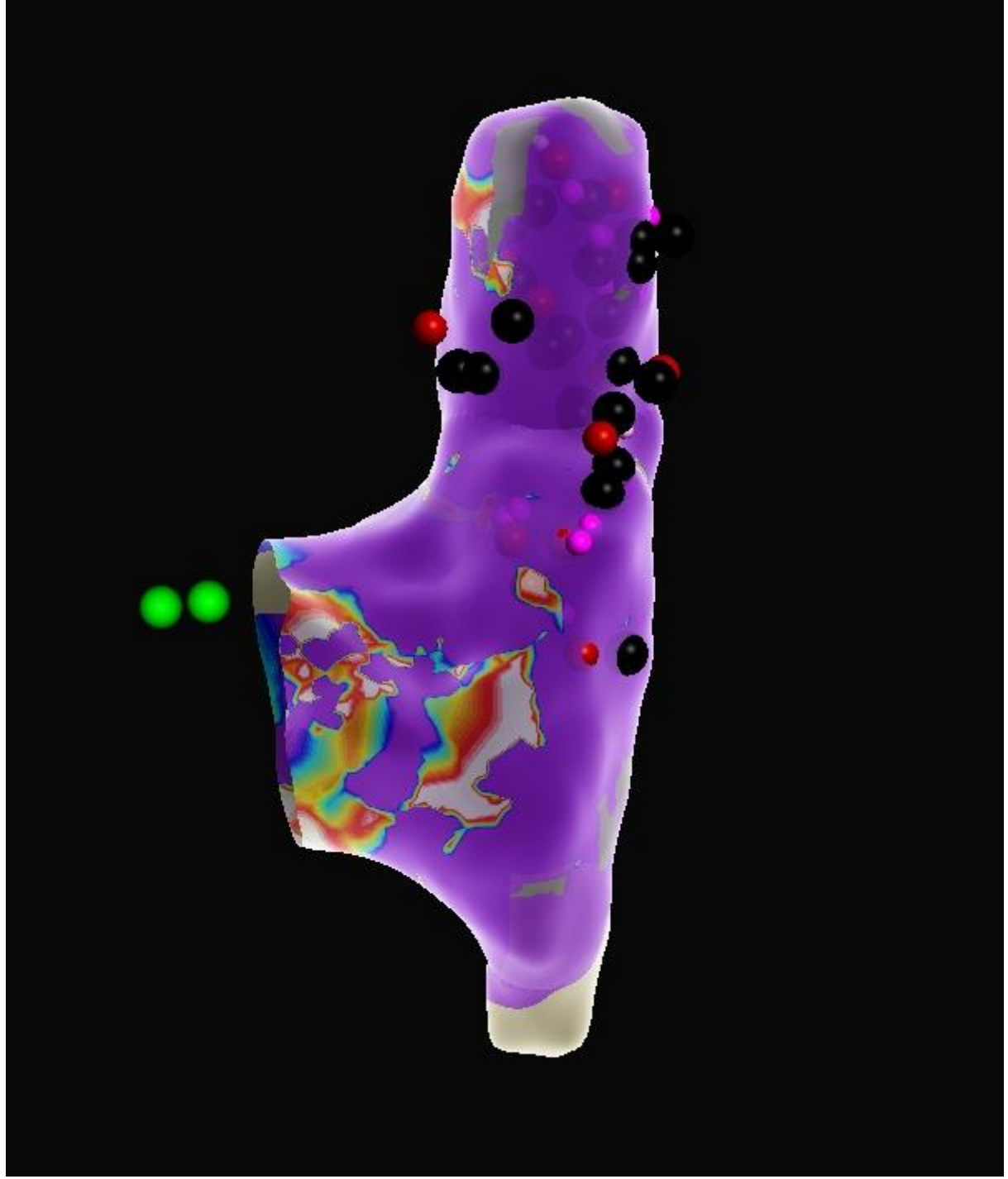


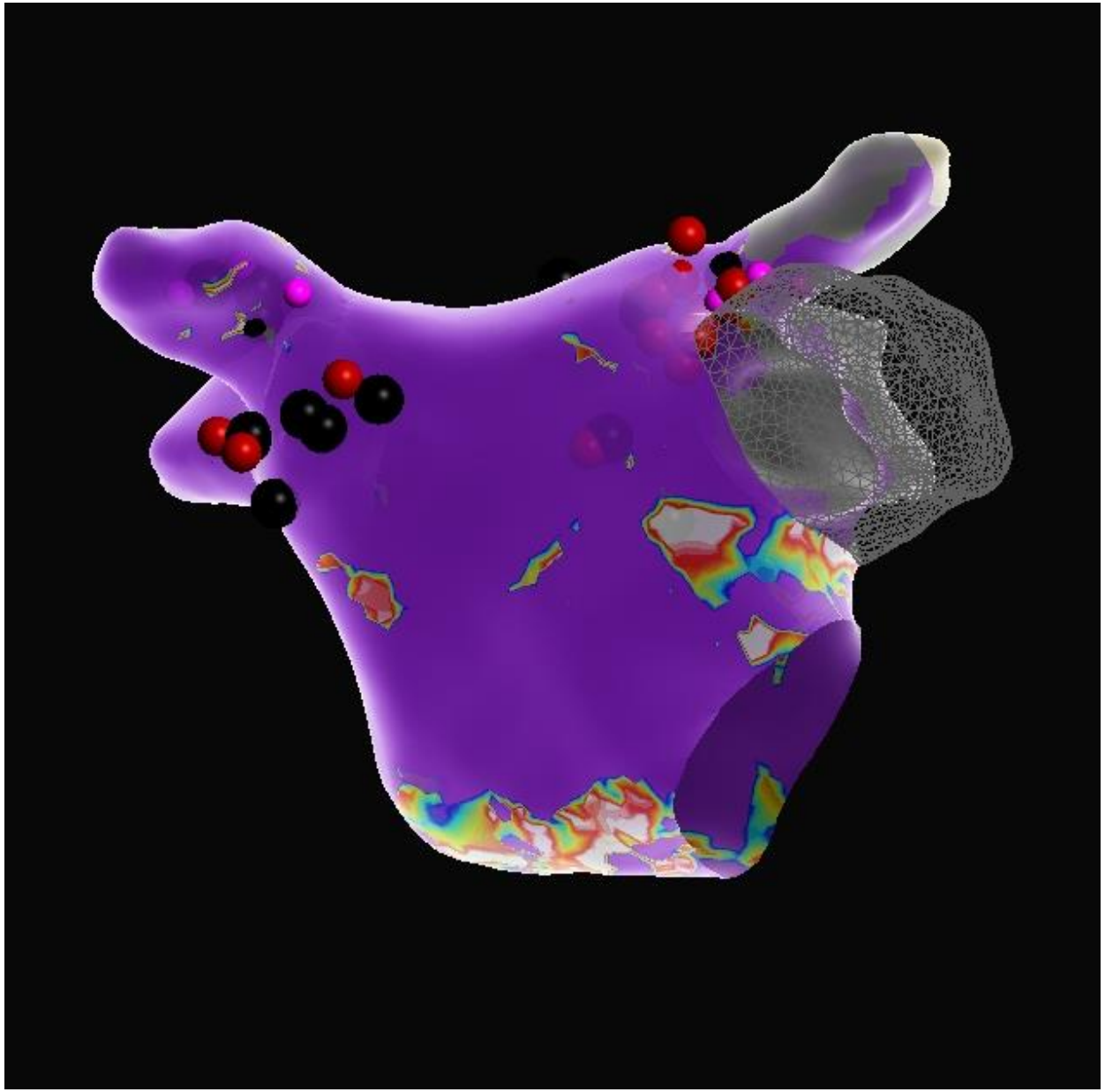


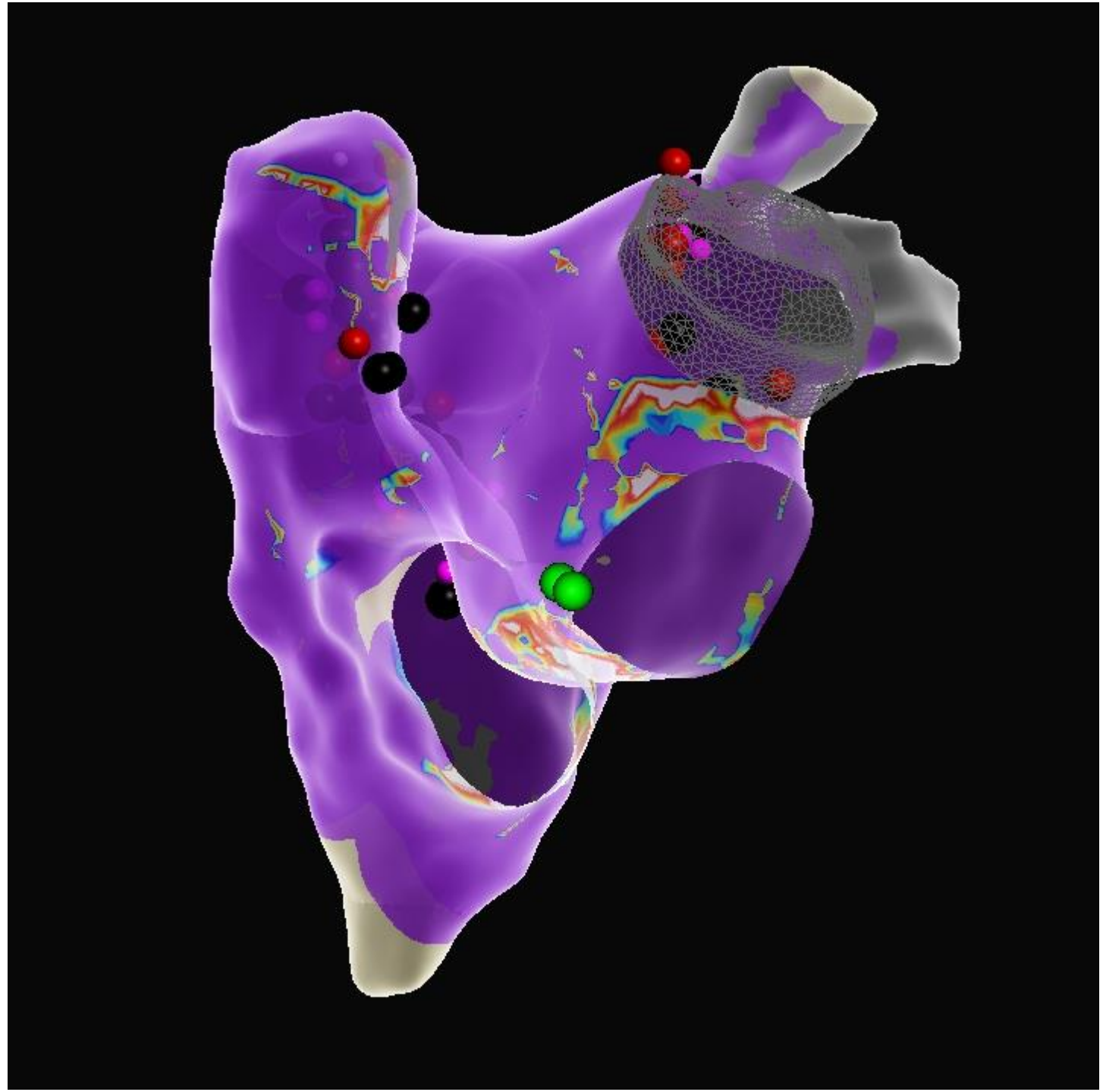




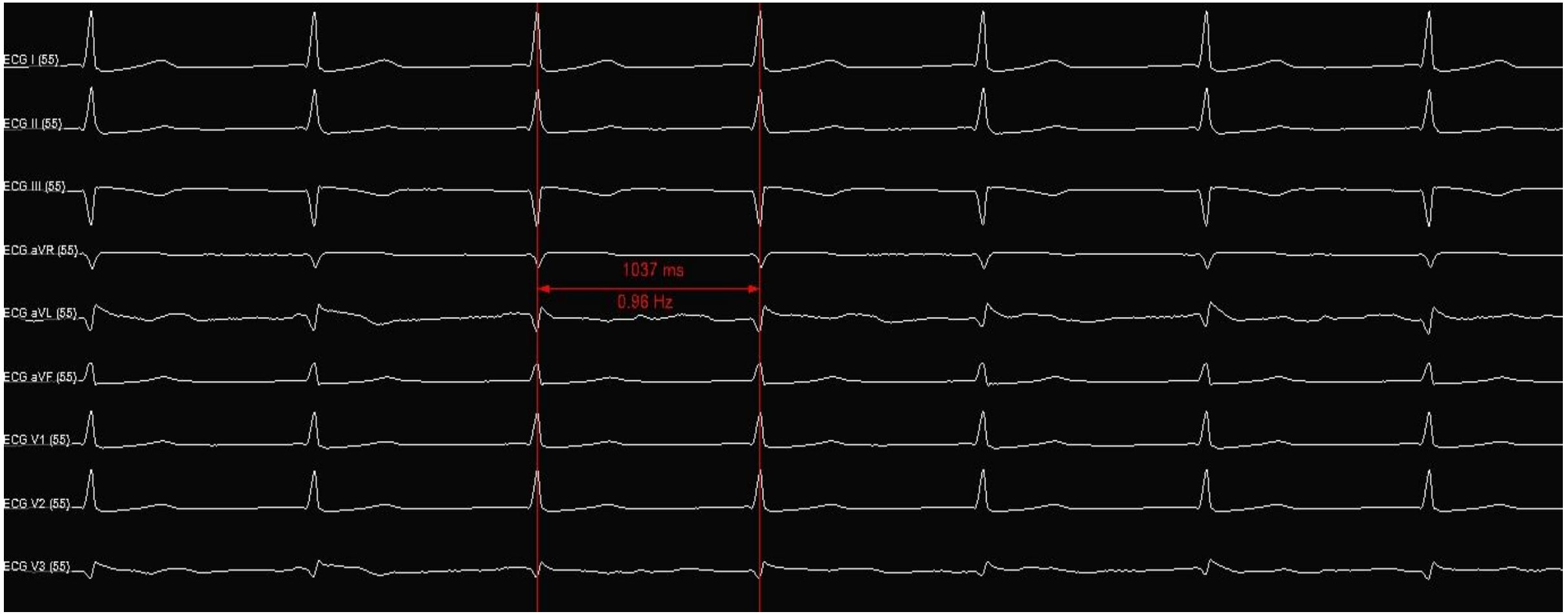

ACCELERATION
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400







ECG fin de procédure



RR 1400ms (début)➔ 1000 ms (fin) (- 28%) LWA 350ms (début procédure) ➔ 300ms (fin)

Nouvelle injection d'atropine = aucun effet

Conclusion

- La cardioneuromodulation dans la syncope vaso vagale cardio inhibitrice (voire mixte) est prometteuse

- Preuves limitées : petites études observationnelles et 1 essai contrôlé randomisé. Procédure à standardiser.

- Résultats à long terme à confirmer (réinnervation ?)

- A limiter au cas par cas chez des patients jeunes et symptomatiques et réfractaires aux traitements usuels ?

Merci de votre attention