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Trucs et Astuces: Tachycardies jonctionnelles

Dr Michaël PEYROL

Unité de Rythmologie

CHU Marseille, Hôpital NORD



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Trucs et Astuces: Tachycardies jonctionnelles

**Comment (tenter de) réduire les récurrences après cryoablation des
tachycardies par réentrée intranodale**

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Conflits d'intérêt: aucune en rapport avec cette présentation



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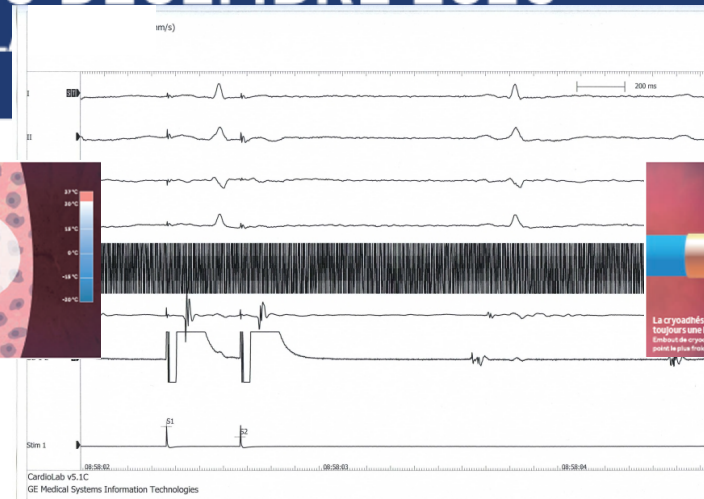
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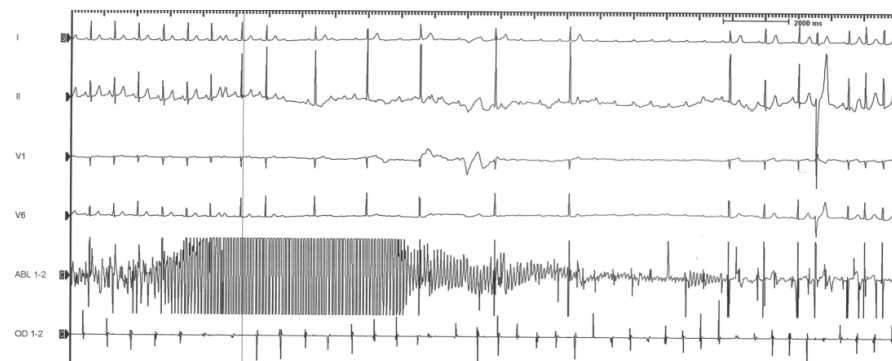
Induction de TRIN OU
Jump **REPRODUCTIBLE**



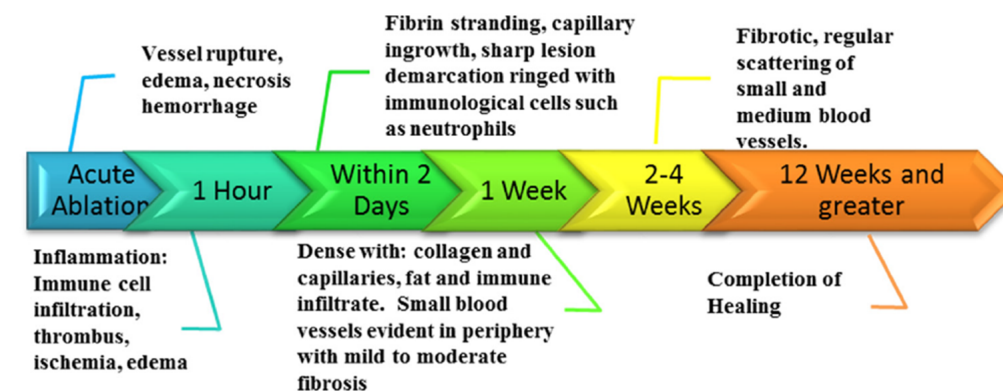
Bloc de conduction voie lente
en **cryomapping**



Non-inductibilité après
cryoablation ET ≤ 1 écho nodal



Réversibilité en **cryomapping**
en cas de trouble conductif





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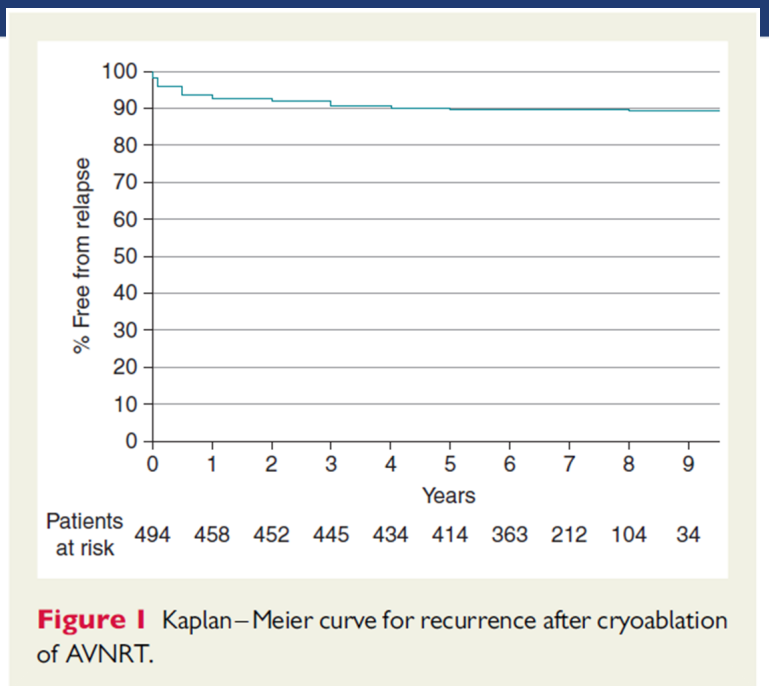
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Table 4 Comparison of CTA using TTT to conventional CTA using 6-mm tip size

Author	Year	N (patients)	F/u (months)	Age (years)	Tip size (mm)	Acute success (%)	Late recurrence rate (%)	Permanent AV block (%)
Jensen-Urstad M [†] et al. [8]	2006	75	9.2	53 ± 16	6	99	7	0
Khairy, et al. [9]	2007	185	24	49 ± 14	6	92	9	0
De Sisti, et al. [10]	2007	150	18 ± 10	39 ± 14	6	95	17	0
Chan, et al. [11]	2009	80	—	50 ± 12	6	97.5	9	0
Bastani, et al. [12]	2009	312	22 ± 10	22 ± 10	6	99	5.8	0
Deisenhofer, et al. [13]	2010	251	6	50 ± 15	6	97	9.4	0



“Several prior studies of CTA for AVNRT have reported an unacceptably high LRR which ranged from 6 % to as high as 17 %”

494 patients successfully ablated with the 6-mm Freezo Xtra

In 11% recurrence occurred, however, recurrence varied from days to 9 years.

Le potentiel de voie lente « idéal » (1)

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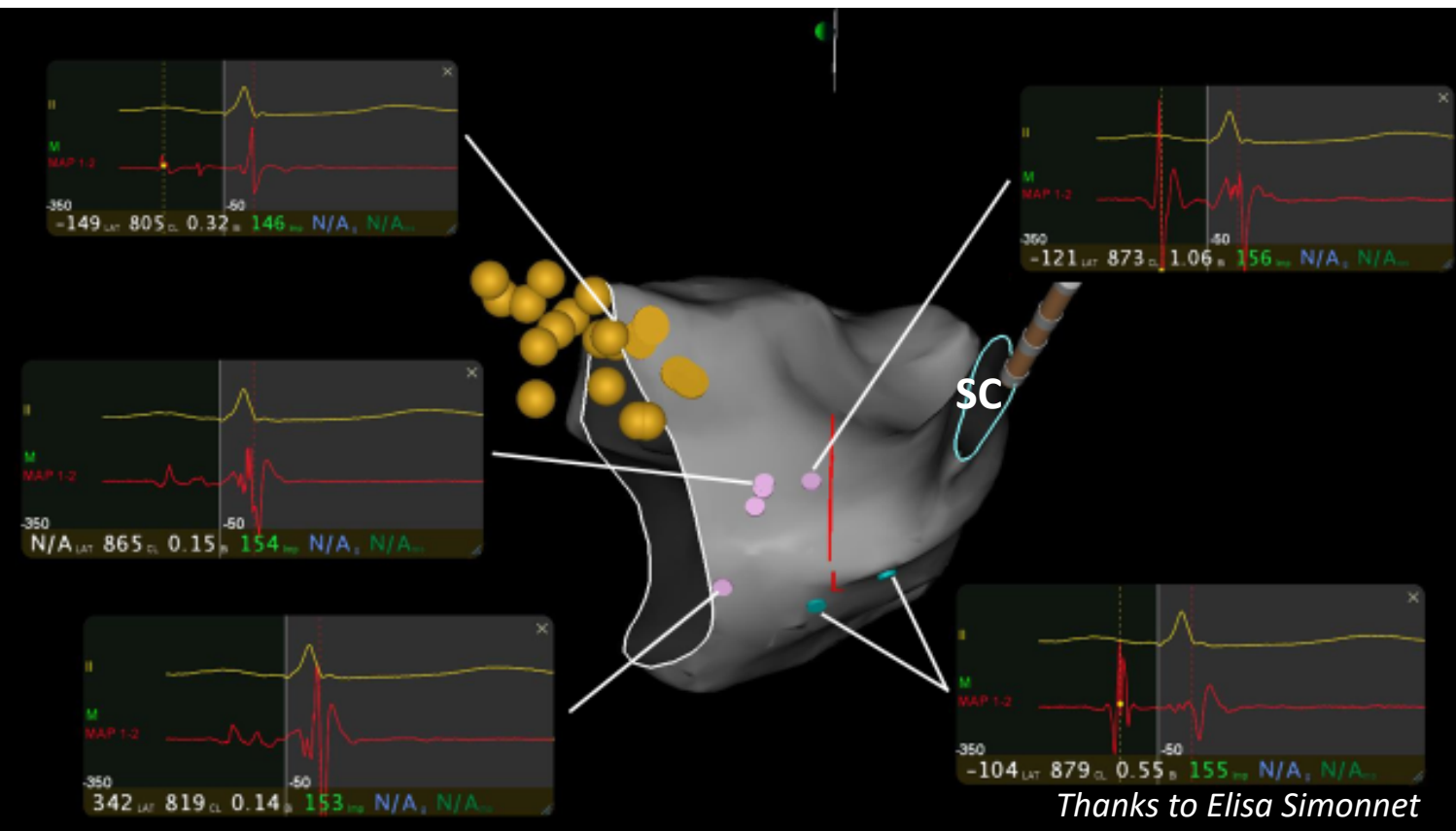
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Local A/V ratio 1/3 to 1/10 and fractionated
terminal component of atrial electrogram

Le potentiel de voie lente « idéal » (1)

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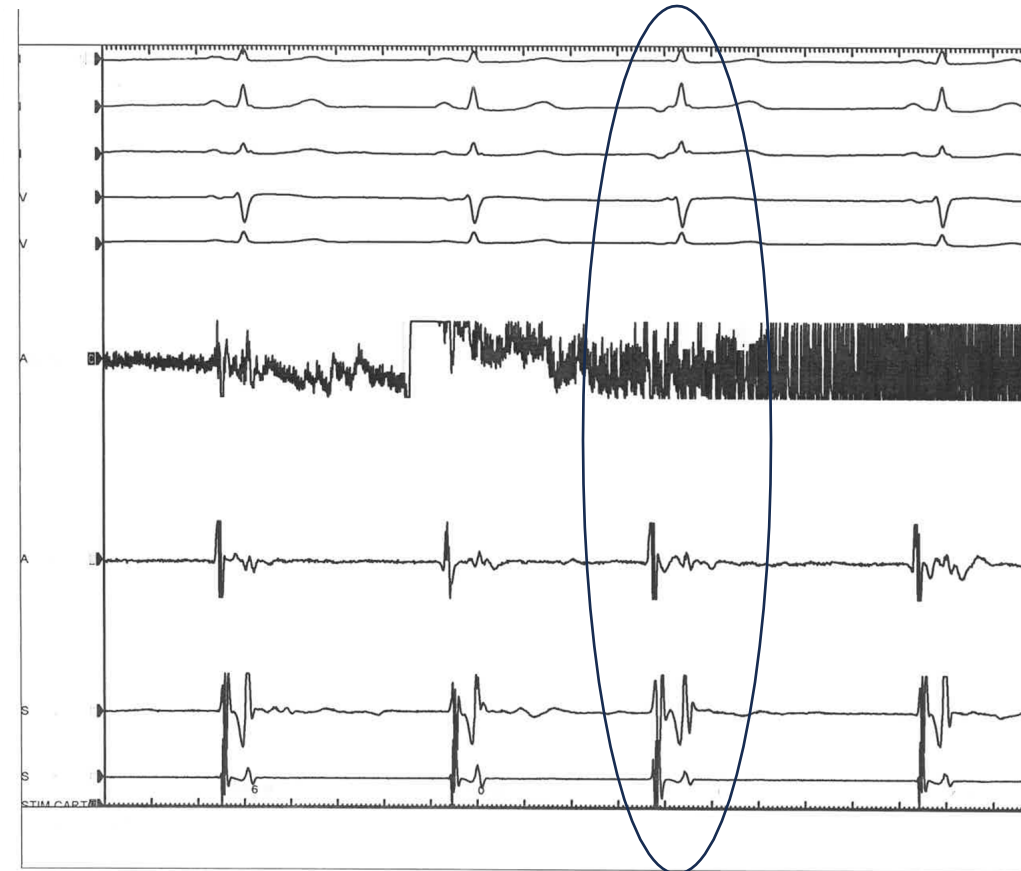
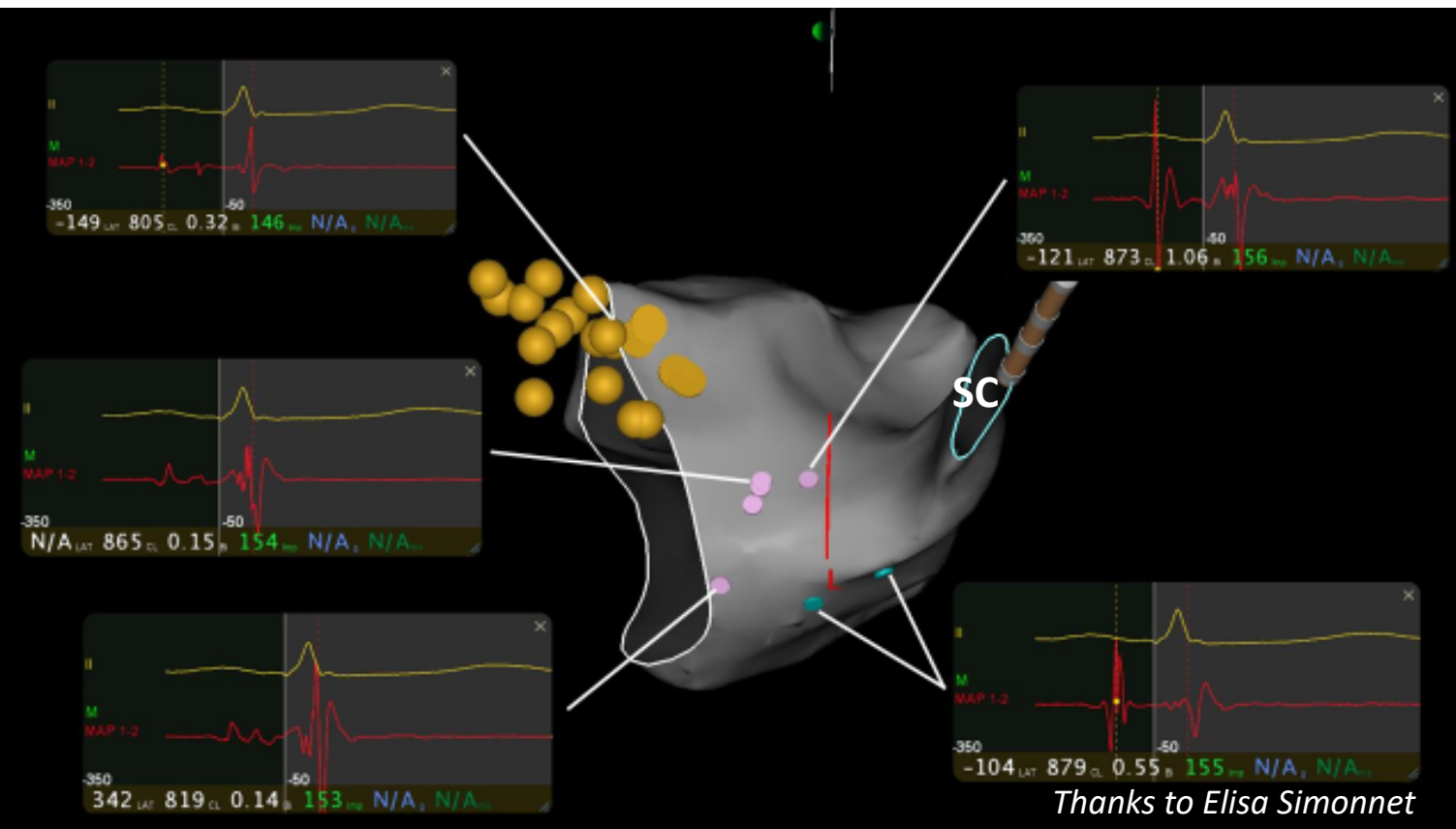
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terminal component of atrial electrogram

Localisation de la voie lente nodale au sein du T. de Koch en Cryo

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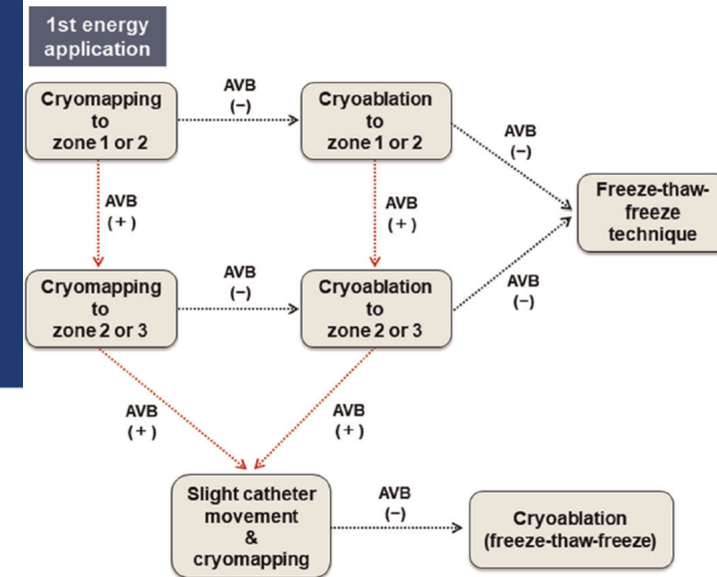
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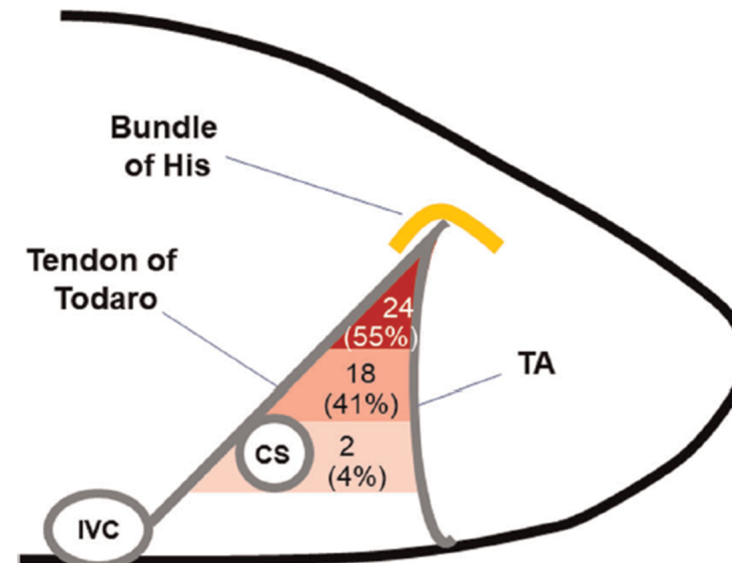
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TABLE 3 Outcomes of cryoapplication and occurrence of AVB during cryoenergy delivery (n = 45)

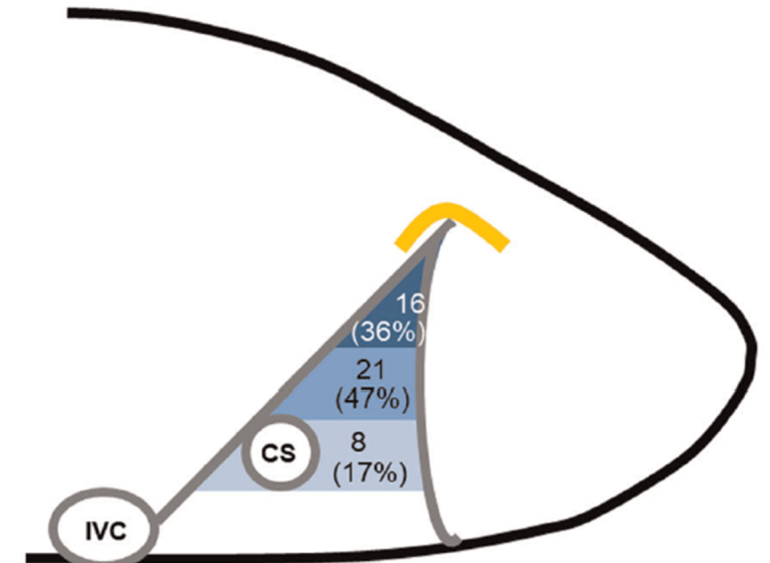
Acute success	45 (100%)
Complete elimination of the slow pathway	43 (96%)
Dual AVN physiology without echo beats	0 (0%)
Dual AVN physiology with a single echo beat	2 (4%)
Local electrogram features at sites of successful cryoablation	
A/V amplitude ratio	0.25 (0.17–0.56)
Delayed discrete or fractionated atrial electrograms	35 (78%)
Transient AVB	28 (62%)
Number of occurrence(s) per patient	1.0 (0–2.0)
First-degree AVB	1 (4%)
Second-degree or higher AVB	27 (96%)
Local electrogram features at sites of transient AVB	
A/V amplitude ratio	0.80 (0.36–1.25)
Delayed discrete or fractionated atrial electrograms	9 (20%)
Complications	
Permanent AVB or AV conduction disturbance	0 (0%)
Femoral artery pseudo-aneurysm	0 (0%)



(A) Sites at which AVB emerged (44 sites)



(B) Sites at which cryoenergy delivery successfully modified the slow pathway (45 sites)



Cryofreezing for slow-pathway modification in patients with slow-fast AVNRT: Efficacy, safety, and electroanatomical relation between sites of transient AV block and sites of successful cryoablation. Fukuda et al. PACE 2021

Relation anatomique entre cathéters de cryoablation et du sinus coronaire

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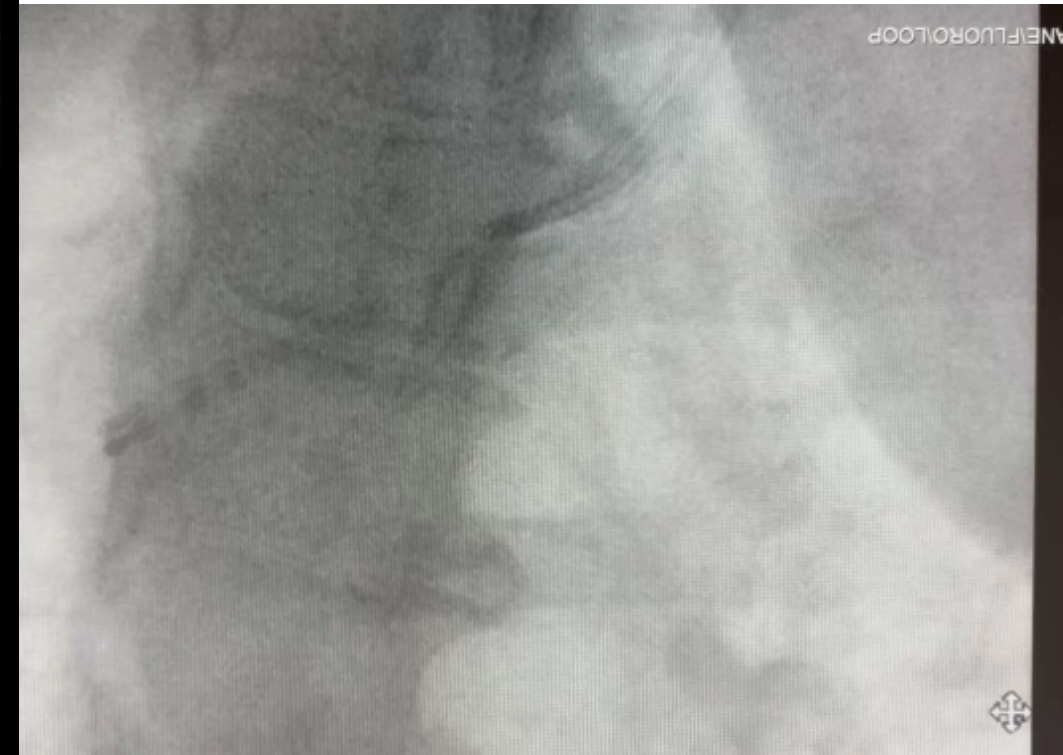
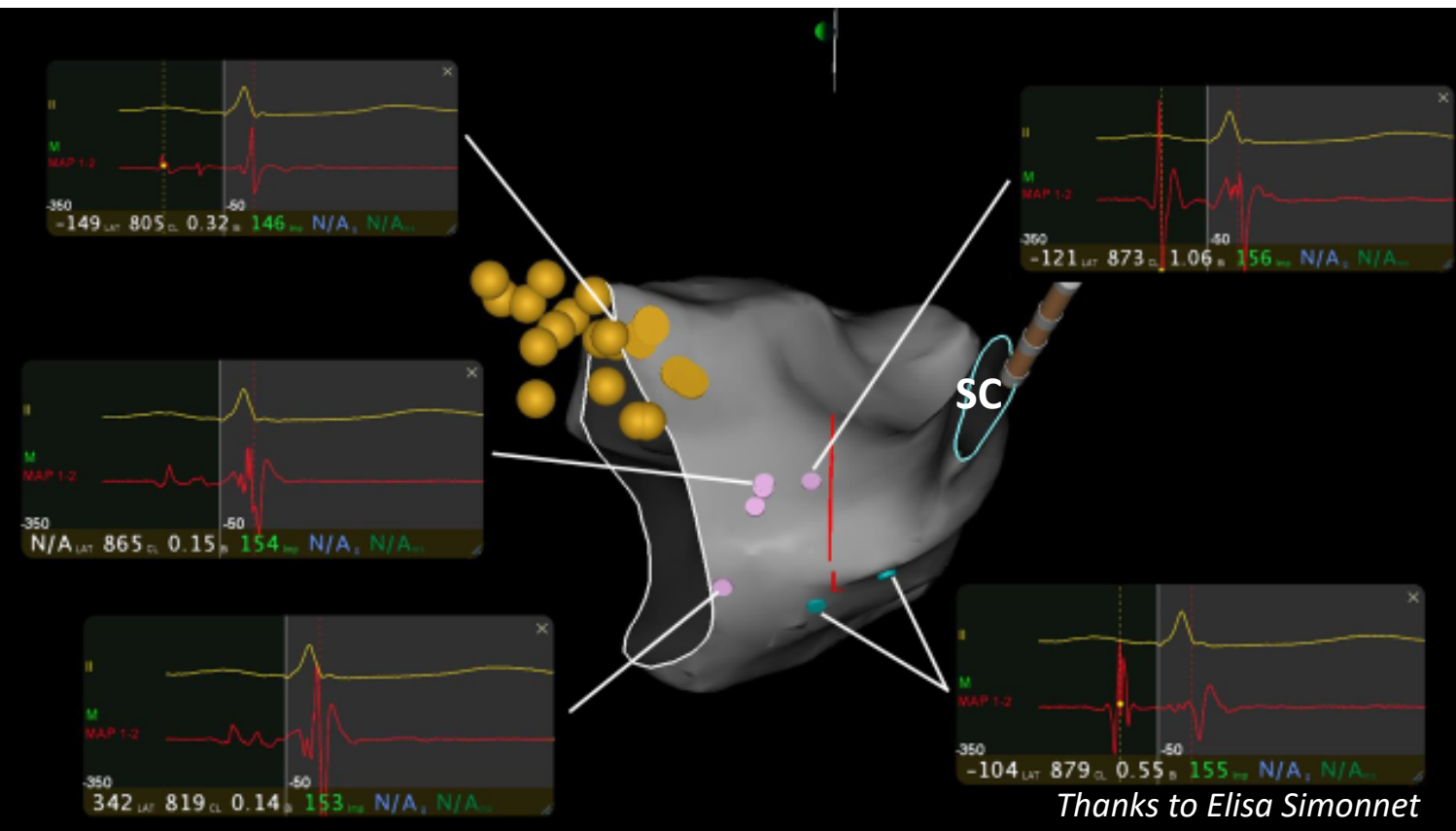
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Local A/V ratio 1/3 to 1/10 and fractionated
terminal component of atrial electrogram

Anatomical criteria

Relation anatomique entre cathéters de cryoablation et du sinus coronaire: intérêt pratique



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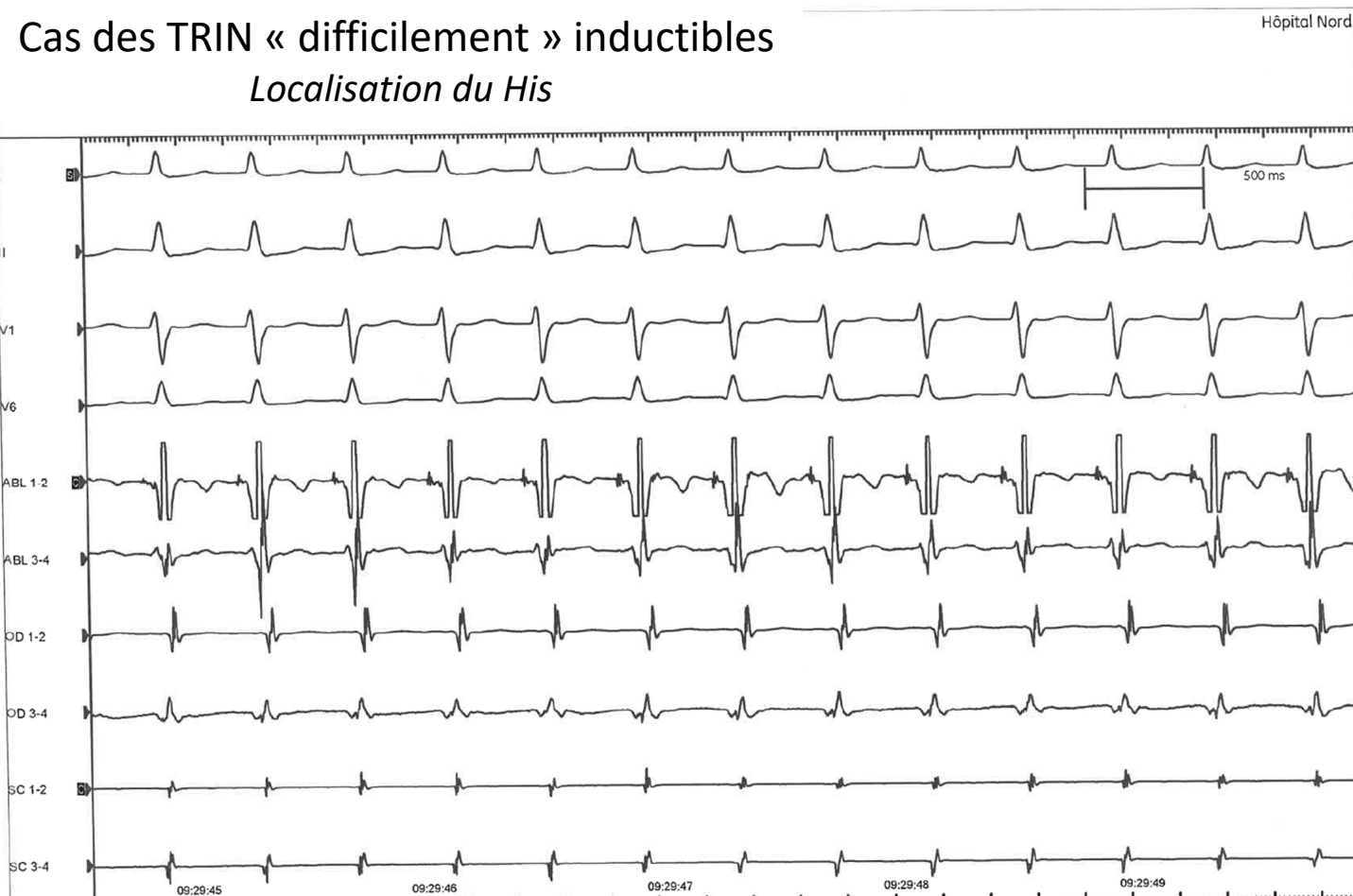
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Cas des TRIN « difficilement » inductibles

Localisation du His



Relation anatomique entre cathéters de cryoablation et du sinus coronaire: intérêt pratique



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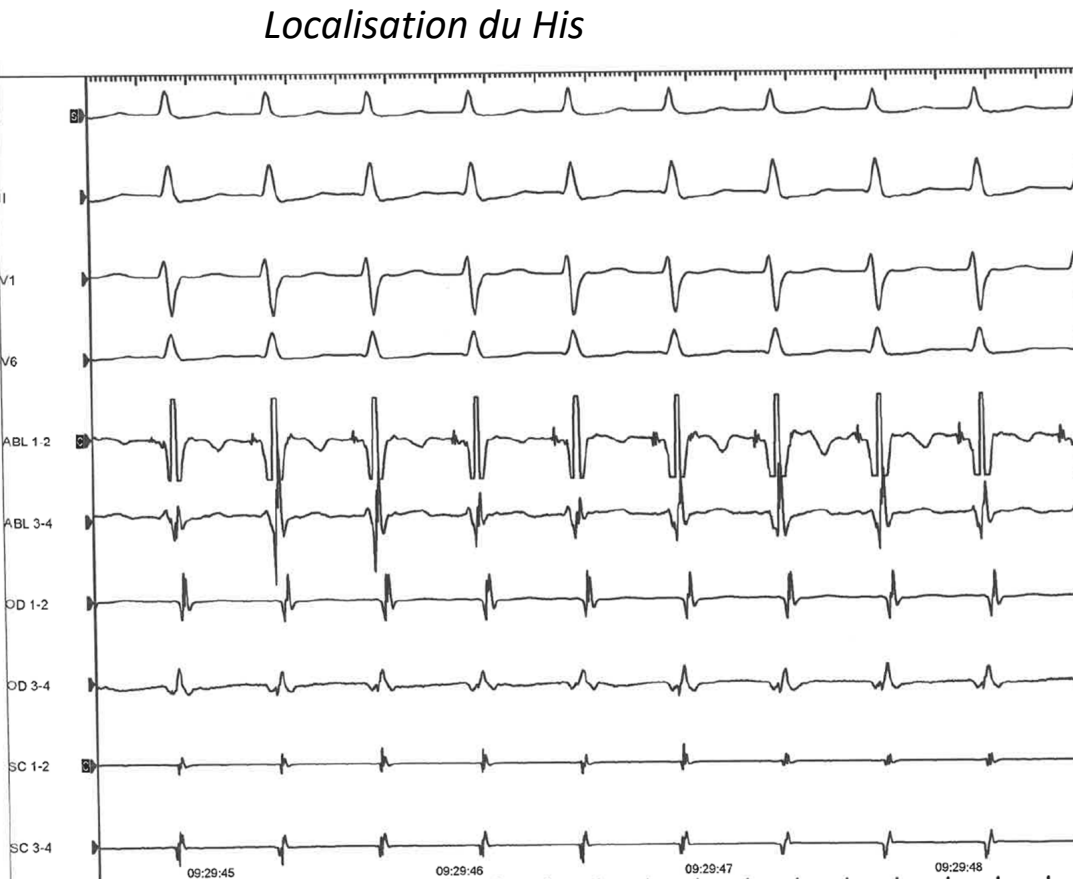
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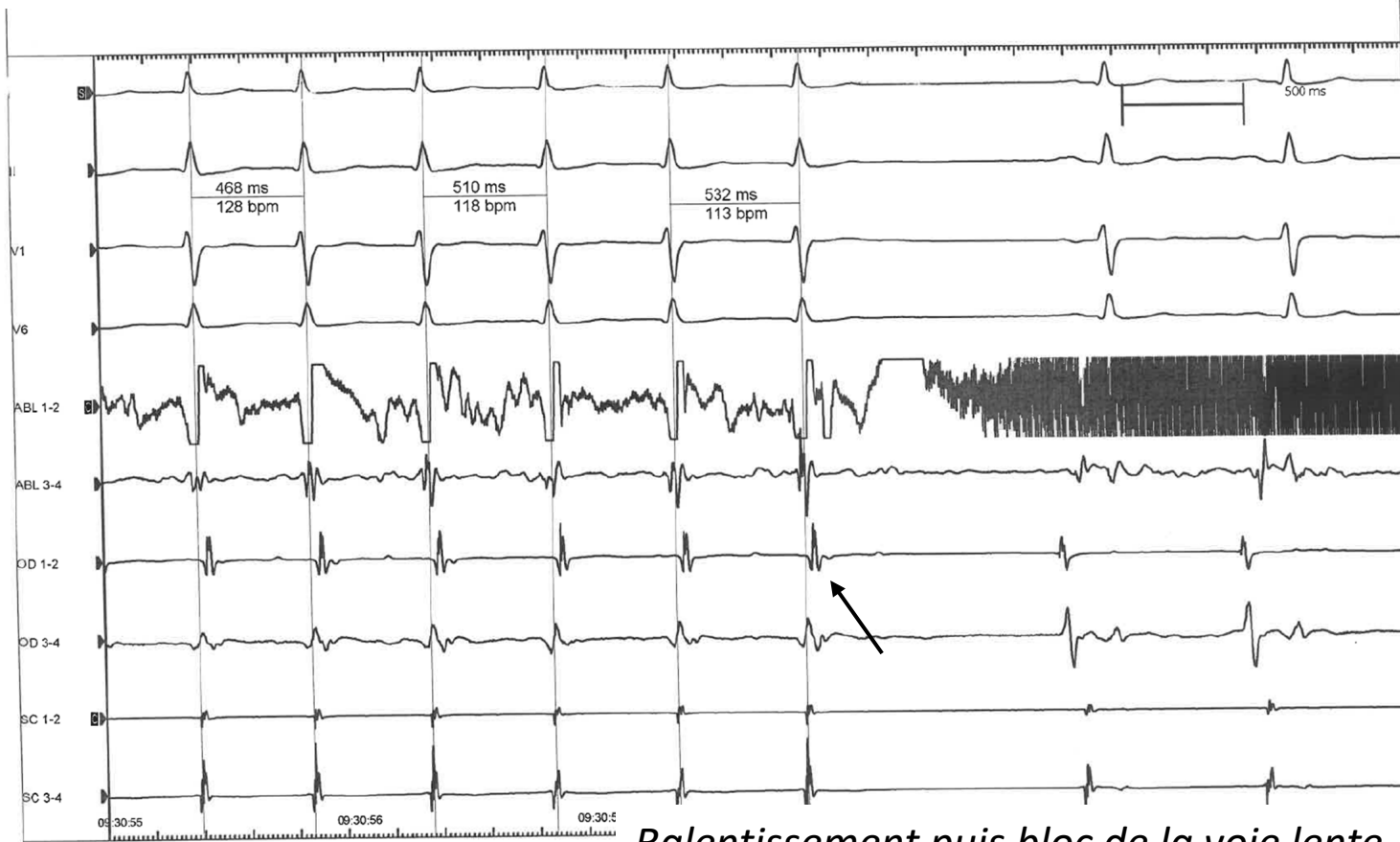
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Cas des TRIN « difficilement » inductibles

Localisation du His



Approche « anatomique »: Cryomapping en cours de tachycardie



« Time to Effect » en cryomapping: marqueur de proximité avec la voie lente

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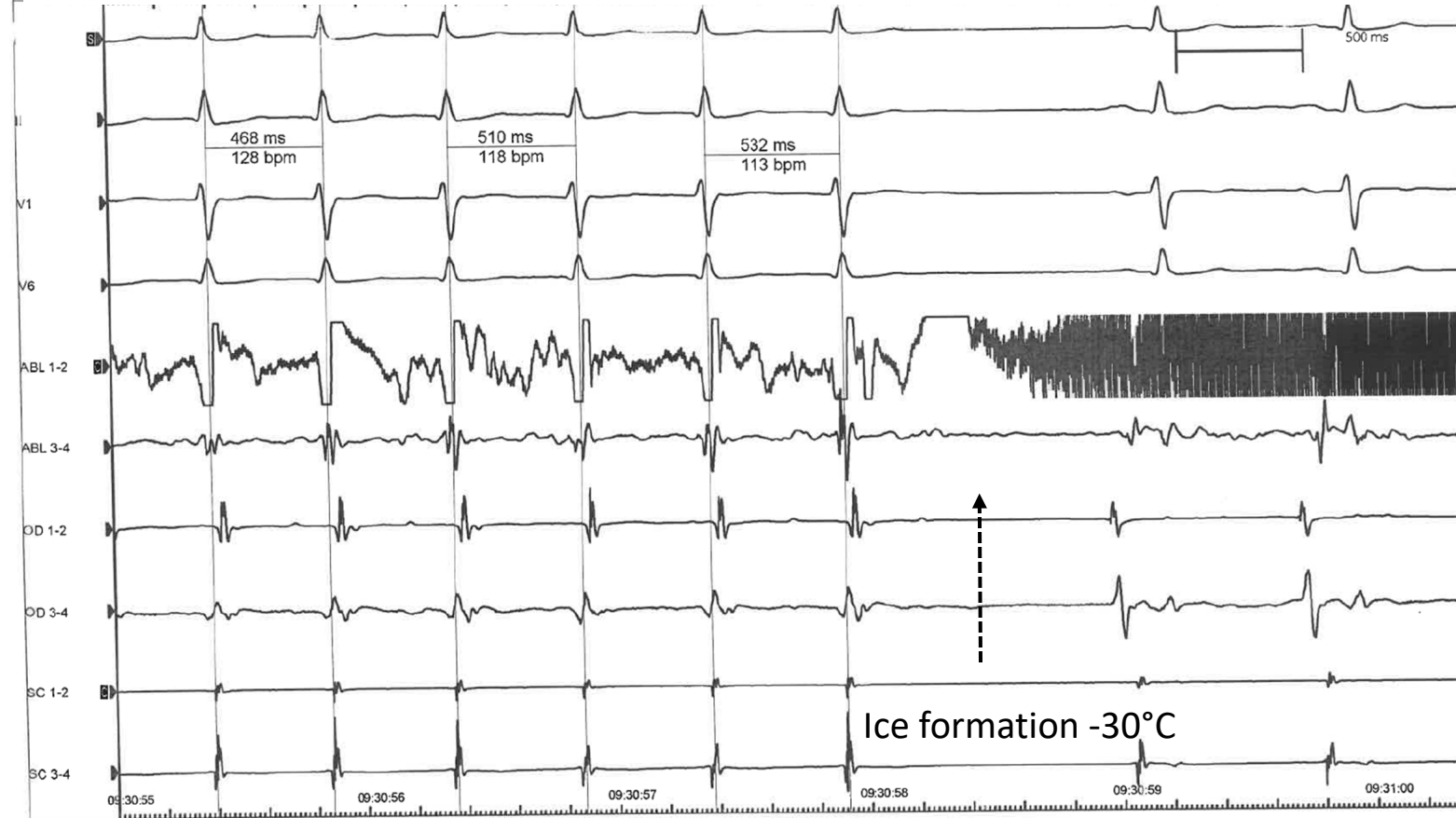
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F 0 2 Approche « anatomique »: Cryomapping en cours de tachycardie

Importance du « **Time to effect** » en cryo mapping = marqueur de proximité avec la voie lente



« Time to Effect » en cryomapping: marqueur de proximité de la voie lente

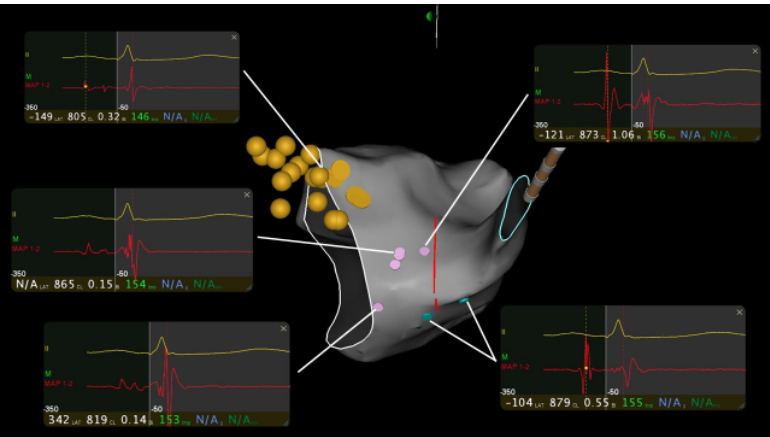


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EAM of Triangle de Koch

Induction of AVNRT

Cryomapping

Aiming AVNRT termination < 20 sec

Table 2 Procedural outcomes for CTA using TTT (n = 88)

Acute procedural success	87 (98.9 %)
Cross over from CTA to RFA	1 (1.1 %)
Number of CTA applications	4.2 (3 to 21)
Residual dual AV nodal physiology	
None	44 (50 %)
Single echoes	43 (48.8 %)
Inducible AVNRT	1 (1.1 %)
Procedure time in minutes (mean ± SD)	155 ± 68
Complications	
Transient complete heart block	3 (3.4 %)
Transient second degree AV block	2 (2.3 %)
Permanent AV block	0 (0.0 %)

Table 3 Long-term arrhythmic outcomes for CTA using TTT (n = 81)

Mean Follow-Up Duration (months)	19.7 ± 23.0
Range (months)	1–110
Late recurrence rate (documented AVNRT)	3.7 % (3/81)
Time to recurrence (months)	1, 1, 26

Time-limited cryomapping during tachycardia: improved long-term outcomes for cryoablation of AVNRT. Eryacizi et al. JICE 2016

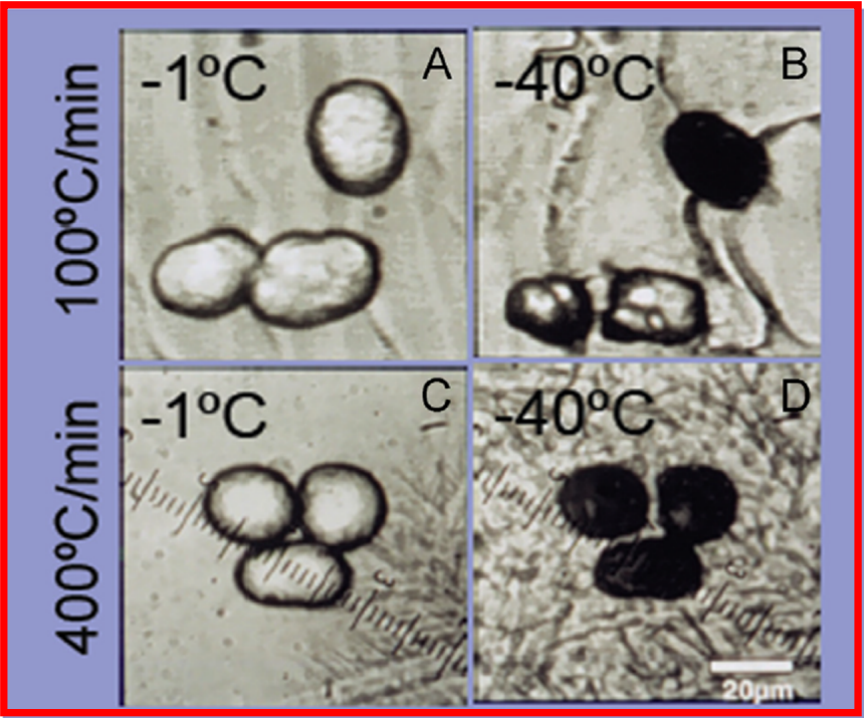


Larger electrode-tip catheters were not associated with significantly deeper lesions

TABLE 1				
Cryoablation Lesion Dimensions According to Electrode-Tip Size				
	Cryocatheter Electrode-Tip Size			P-Value*
	4 mm	6 mm	8 mm	
All lesions				
Depth, mm	3.5 ± 1.8	4.6 ± 2.1	4.8 ± 2.2	0.2251
Surface area, mm ²	51.9 (28.7, 68.3)	71.3 (24.8, 123.3)	114.7 (57.3, 225.5)	0.0021
Volume, mm ³	73.2 (33.4, 134.6)	137.7 (77.3, 153.8)	243.0 (104.8, 597.7)	0.0049
Atrial lesions				
Depth, mm	3.6 ± 1.4	4.9 ± 1.9	4.9 ± 1.2	0.4807
Surface area, mm ²	51.1 (33.4, 65.9)	52.5 (15.8, 60.2)	106.9 (83.1, 179.7)	0.0041
Volume, mm ³	72.5 (63.6, 144.9)	104.7 (62.7, 137.7)	260.6 (169.9, 604.2)	0.0027
Ventricular lesions				
Depth, mm	3.4 ± 2.0	4.3 ± 1.9	4.8 ± 2.7	0.0785
Surface area, mm ²	52.3 (28.7, 84.8)	73.8 (27.7, 139.5)	122.1 (22.9, 277.1)	0.0254
Volume, mm ³	81.6 (27.5, 134.6)	140.4 (90.7, 169.4)	222.5 (74.4, 449.1)	0.0116

Nonnormally distributed variables are presented as median and interquartile range (25th, 75th percentile).
*Adjusted by generalized estimating equations.

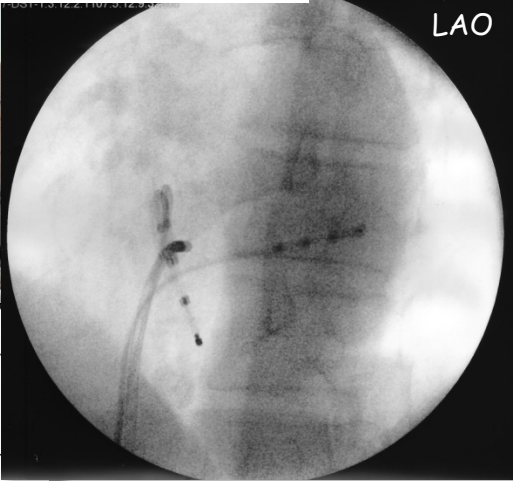
Rapide freezing to – 40°C was associated with more ice formation



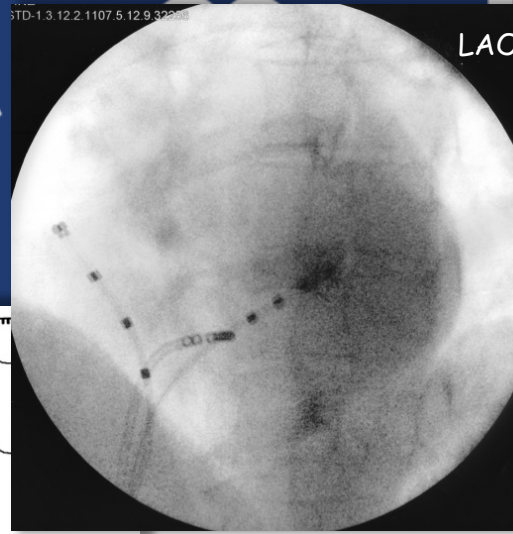
Cryotherapy of cardiac arrhythmia: From basic science to the bedside. Avitall et al. Heart Rhythm 2015

Morphometric Ablation Lesion Characteristics Comparing 4, 6, and 8 mm Electrode-Tip Cryocatheters. Khairy et al. JCE 2008

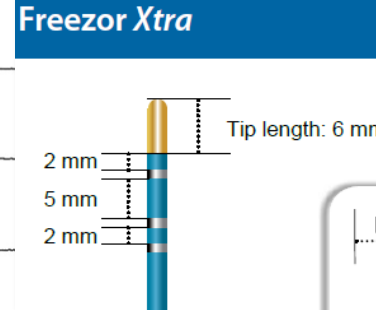
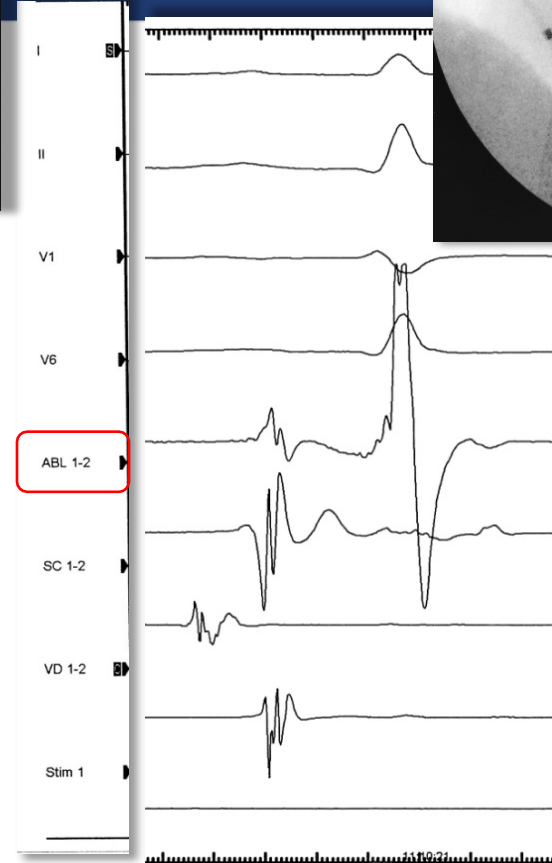
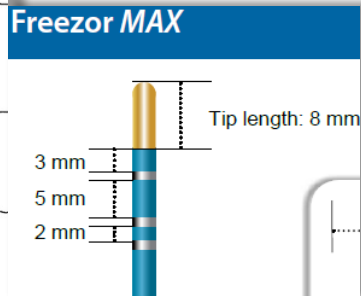
Cathéter 8-mm Freezor Max™



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Freezor® Max 9F 8-mm tip

CRYOABLATION ONLY
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Freezor® Xtra 7F 6-mm tip

Comparison of signals at effective ablation site with the 8-mm and 6-mm tip cryocatheter



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Table 1 Clinical characteristics

Number of patients	82
Male/female	30/52
Mean age (years)	54.9±17.7
Structural heart disease (%)	15 (18.3)
Hypertension	9
Coronary artery disease	6
Mean follow-up (months)	17.8±9.3
AVNRT recurrence (%)	4/82 (4.9)

AVNRT atrioventricular nodal reentrant tachycardia

EPS was initiated since cryocatheter tips temperature drops -30 °C = ice formation

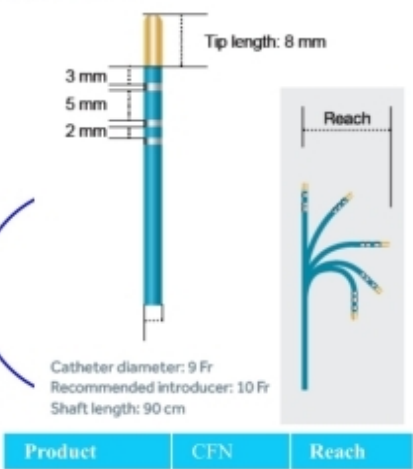
Table 2 Procedural characteristics

Mean procedure time (min)	74.4±28.7
Mean fluoroscopy time (min)	8.7±5.3
Number of cryoapplication	4.0±2.4
Jump in AV conduction (%)	73 (89)
Cryoablation induced transient AVB ^a (%)	12/81 (14.8)
Mechanical induced AVB (%)	1/82 (1.2)
Permanent AVB (%)	0/82
AVNRT non-inducibility (%)	81/82 (98.7)
Lowest temperature at effective site (°C)	-81.7±1.1

AVB atrioventricular block, AVNRT atrioventricular nodal reentrant tachycardia

^a Cryoablation induced AVB was analyzed in 81 patients as in one patient mechanical AVB occurred before cryoenergy application

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Slow pathway elimination for atrioventricular nodal reentrant tachycardia with the 8-mm tip cryoablation catheter: an 18-month follow-up study. Peyrol M, Sbragia P et al. JICE 2012

Quel endpoint de la procédure? : chasser l'écho nodal

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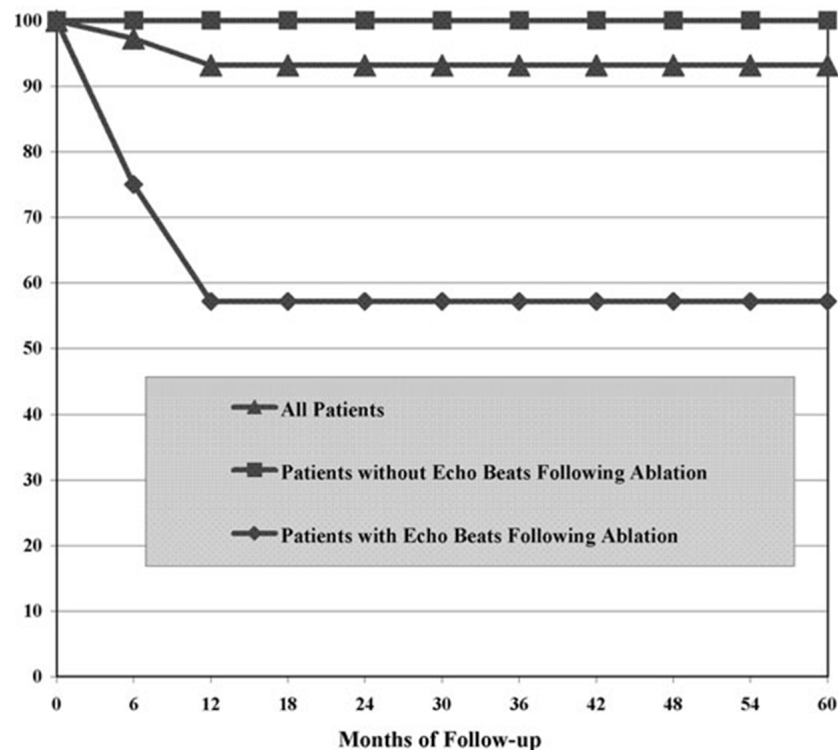
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Freedom of SVT Recurrence (%)



Cryoablation for AVNRT: Importance of Ablation Endpoint Criteria.

Eckhardt et al. JCE 2012

Quel endpoint de la procédure? : chasser l'écho nodal



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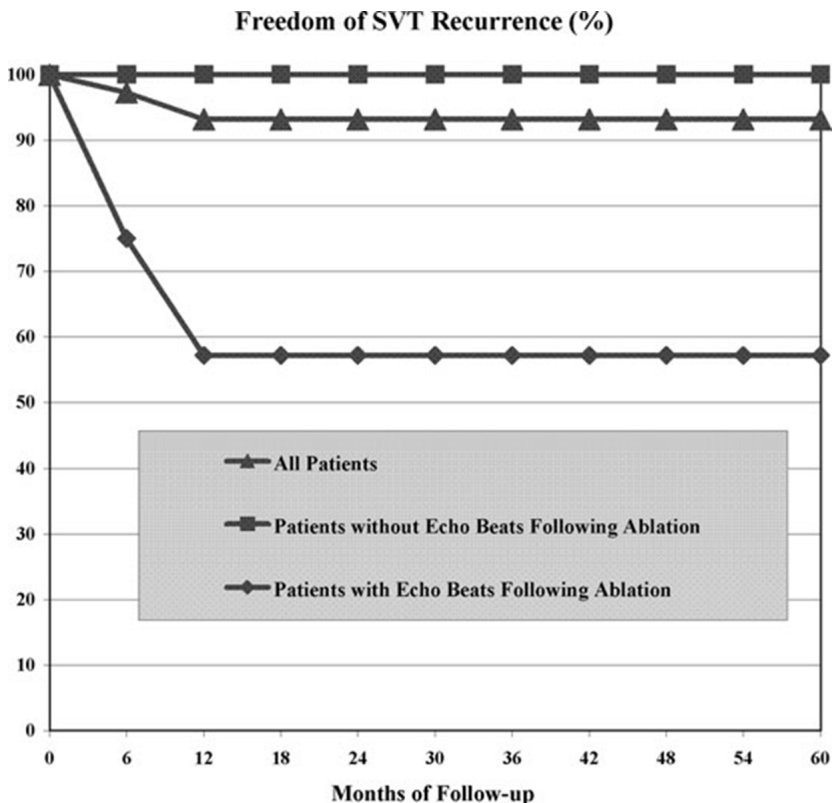
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Ablation Results and Follow-Up

	Total Number	Number of Recurrences	Percentage of Recurrences $\pm$ SD*
Uniform isoproterenol (n = 1,001)			
No residual pathway	508	27	5.3 $\pm$ 1.0
Jump only	177	9	5.1 $\pm$ 1.7
Single echo only	316	12	3.8 $\pm$ 1.1
Jump or single echo	493	21	4.3 $\pm$ 0.9
Nonuniform isoproterenol (n = 203)			
No residual pathway	133	1	0.8 $\pm$ 0.7
Jump only	15	4	26.7 $\pm$ 11.4
Single echo only	55	12	21.8 $\pm$ 5.6
Jump or single echo	70	16	22.9 $\pm$ 5.0

Isoproterenol should be used routinely after slow pathway modification, when a residual jump and/or single echo remain



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Comment (tenter de) réduire les récurrences après cryoablation des tachycardies par réentrée intranodale

Conclusions

- Un potentiel au site d'ablation marqué par un rapport AV 1/3 à 1/10
- La relation entre Cryocathéter et sonde du sinus coronaire est un élément à prendre en considération
- Time to effect apparait comme un élément probablement déterminant du succès de la procédure
- Chasser la dualité nodale résiduelle avec l'isoprotérénol