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4-5 DÉCEMBRE 2021

HOTEL VILLA M.
MARSEILLE | FRANCE

1⁵èmes journées françaises
pratiques de rythmologie
& de stimulation cardiaque

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**19^{èmes} journées françaises
pratiques de rythmologie
& de stimulation cardiaque**

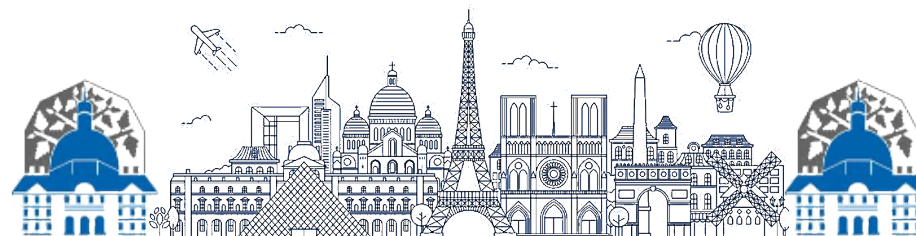
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Tachycardie atriale focale Cartographie 3 D

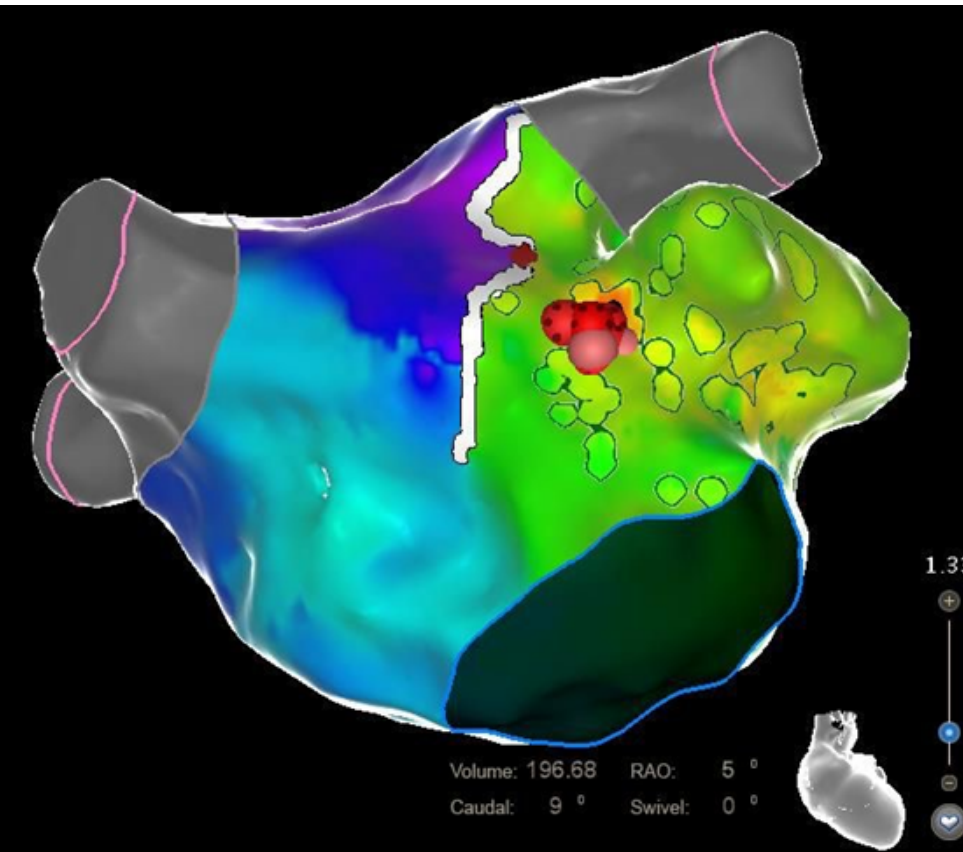
Dr X. Waintraub

Département de cardiologie Unité de Rythmologie

Groupe Hospitalier Pitié Salpêtrière



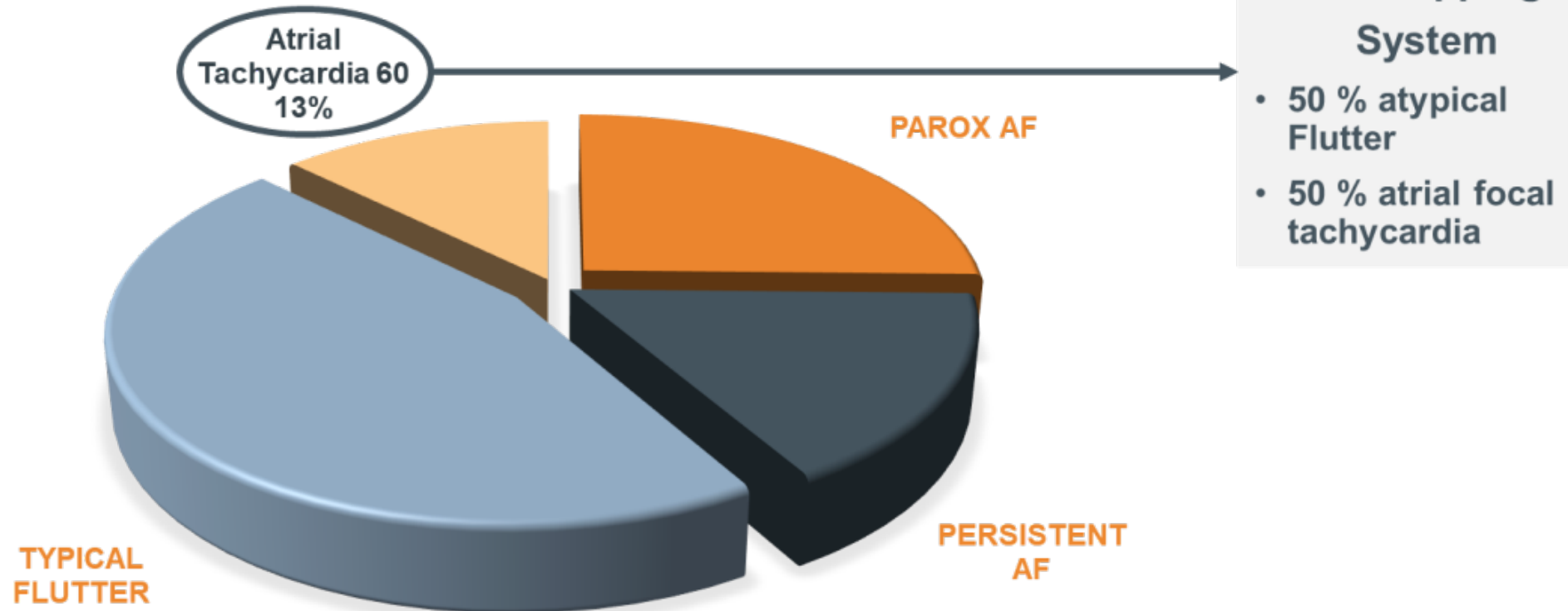
Tachycardie atriale focale



- Les TA focales sont définies comme des arythmies
- provenant d'un site circonscrit d'activation précoce
 - se propagent selon un motif centrifuge.

Epidémiologie

ATRIAL ARRHYTHMIAS ABLATIONS



Epidémiologie sur oreillette pathologique

Focal AT n = 20 (9%)

17 Patients: 10 post AF ablation,
6 native atria

Cycle length 305 ± 84ms

EGMs at Earliest Site:

- Fragmented EGM: 55%
- Amplitude of EGM: 0.65 ± 0.60mV
- Duration of EGM: 65.6 ± 45.4 ms

100% of acute termination during
RF ablation

Duration of RF for AT term:
106 ± 189 s

Localized Re-Entry n = 57 (27%)

47 Patients: 37 post AF ablation,
8 native atria, 2 post MVR

Cycle length 287 ± 76ms

EGMs at Critical Isthmus:

- Fragmented EGM: 100%
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Characteristics of the Circuit

- Diameter of the circuit
25.8 ± 12.2mm (8-56mm)
- Shortest length of the critical
isthmus: 11.8 ± 7.2mm

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Circuit of AT always scar related ±
anatomic obstacle

Macro-Re-Entry n = 129 (60%)

93 Patients: 83 post AF ablation,
5 native atria, 4 post surgery

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EGMs at Ablation Site:

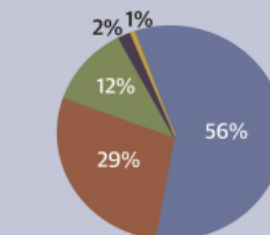
- Fragmented EGM: 73%
- Amplitude of EGM: 0.43 ± 0.68mV
- Duration of EGM: 83.2 ± 36.3ms

Characteristics of the Circuit

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44.2 ± 9.6mm
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isthmus: 15 ± 9mm

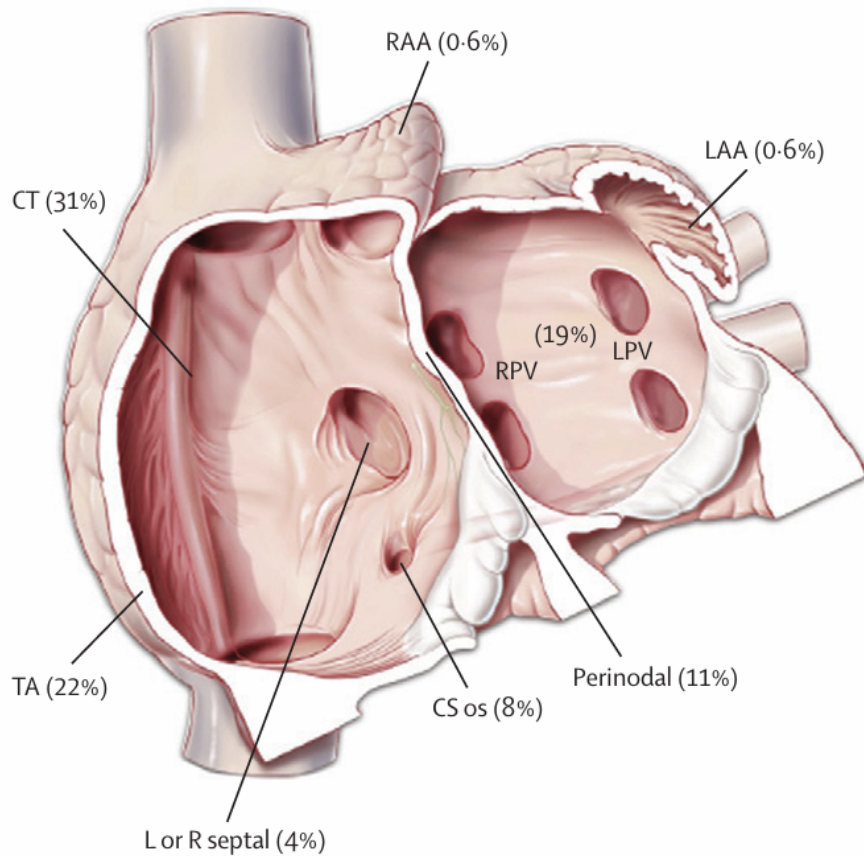
93% of acute termination: 116/129

Duration of RF for AT term:
430 ± 688 s

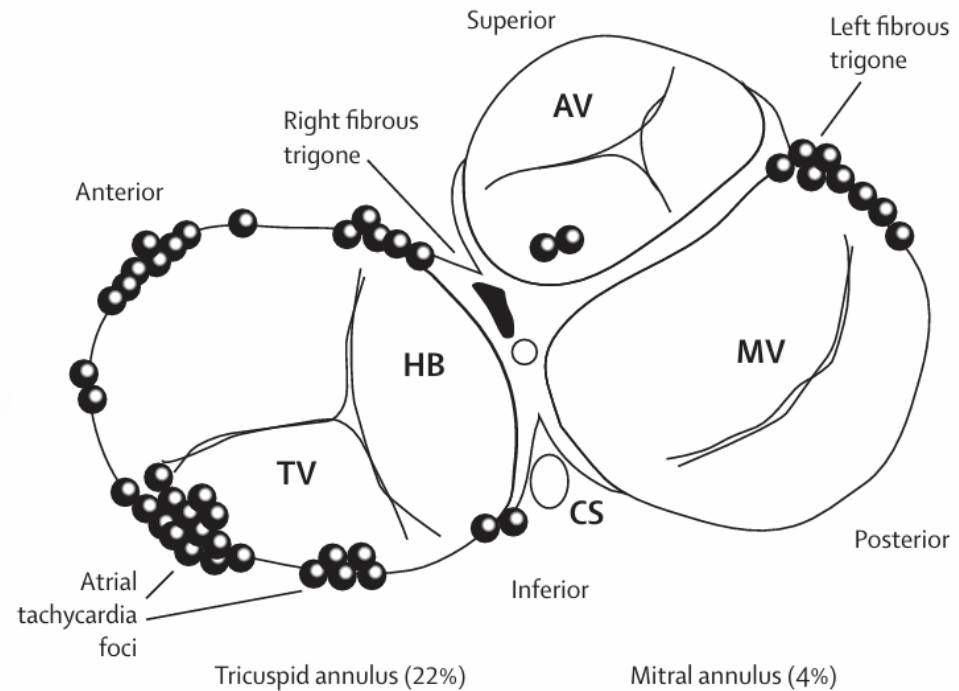


Anatomie des TA focales

A Anatomic distribution of focal atrial tachycardias

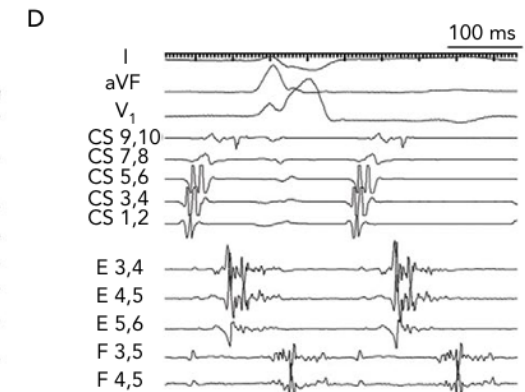
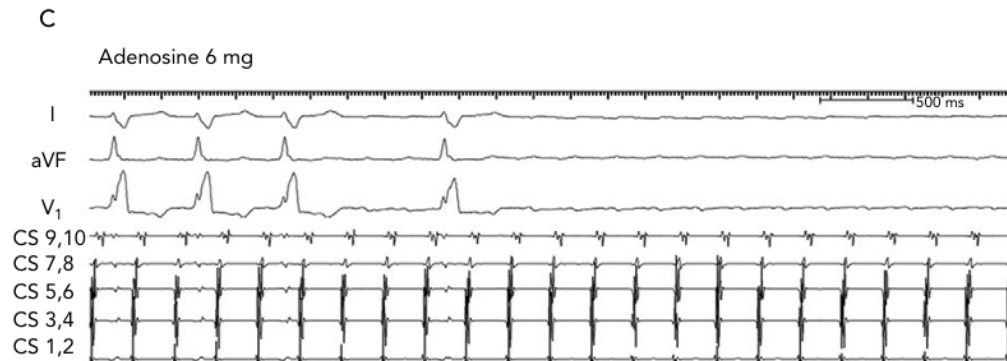
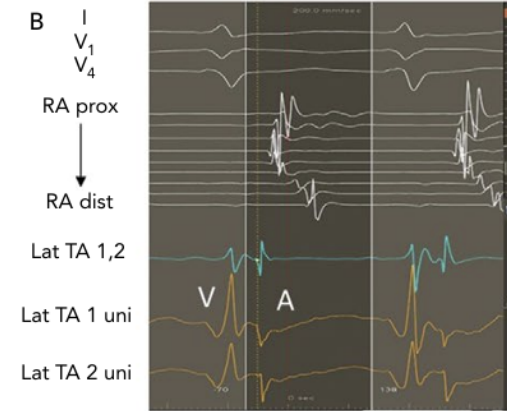
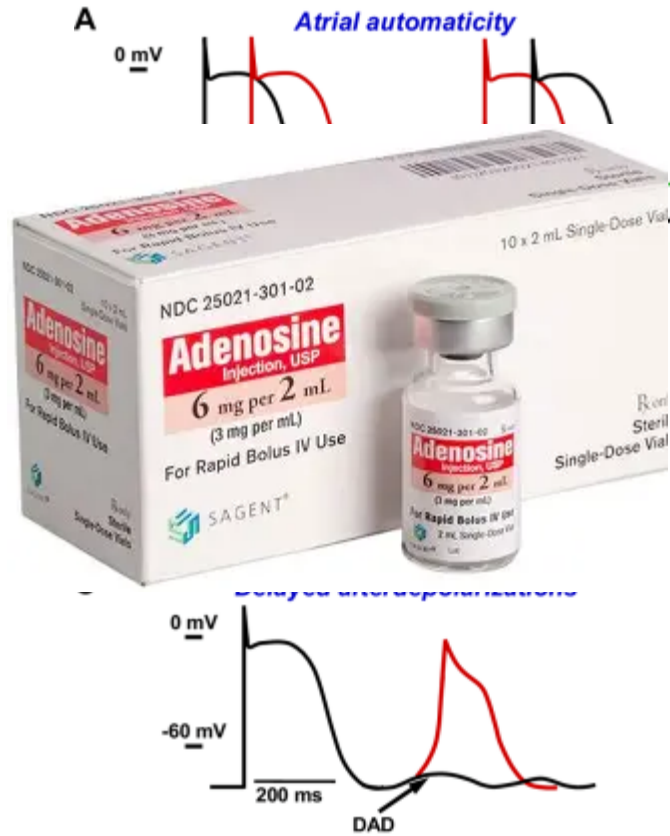


B Anatomic distribution of mitral and tricuspid annular atrial tachycardias



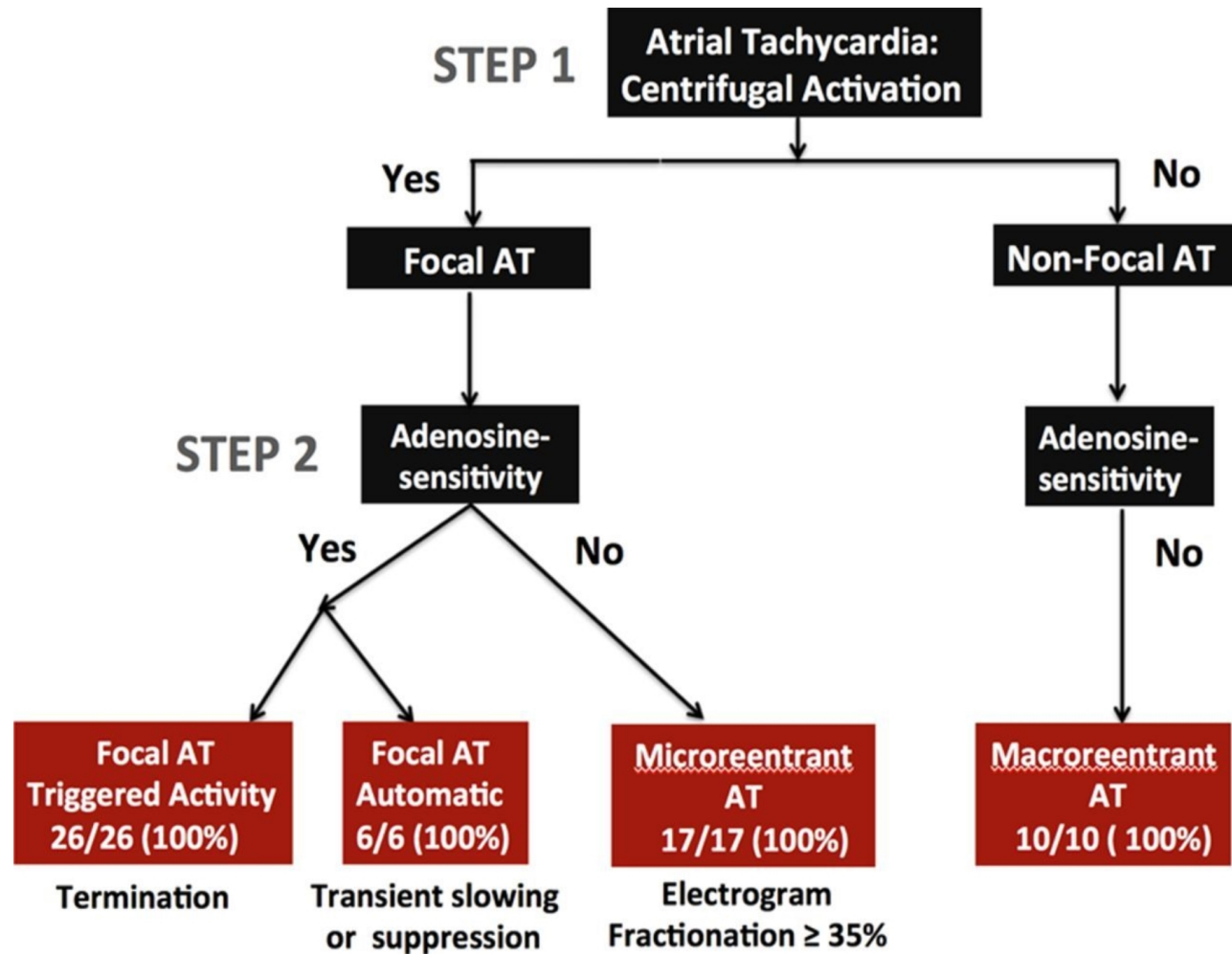


Focal vs réentrant

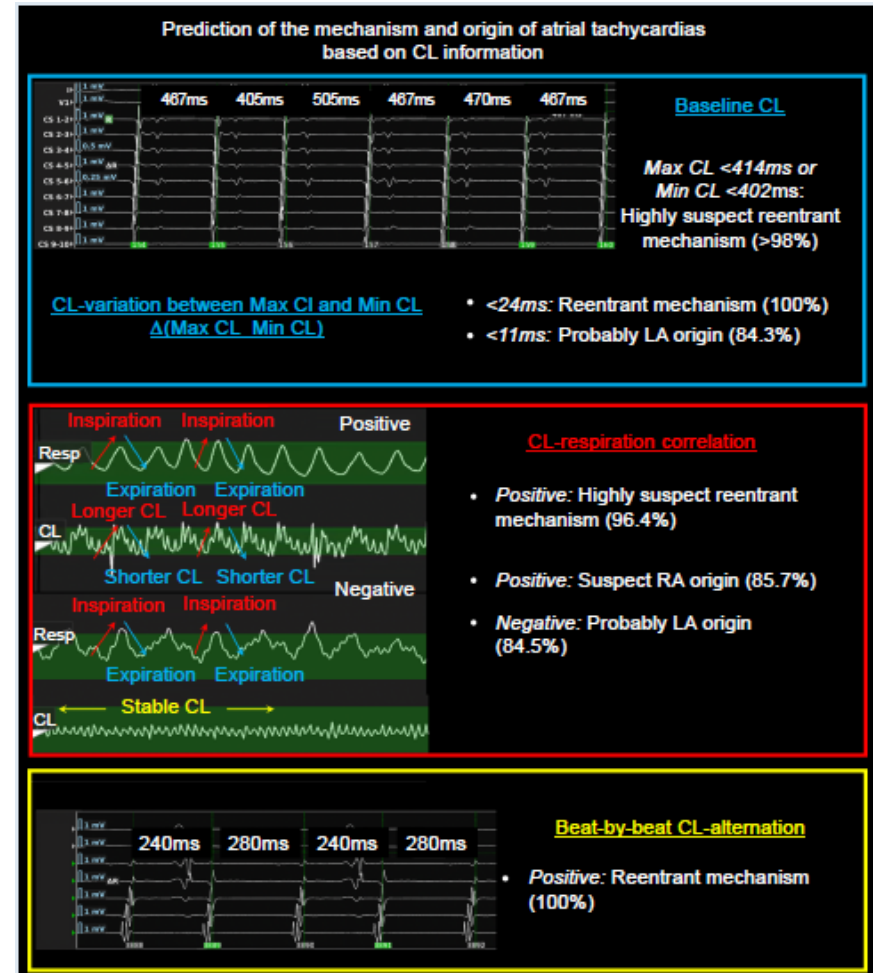
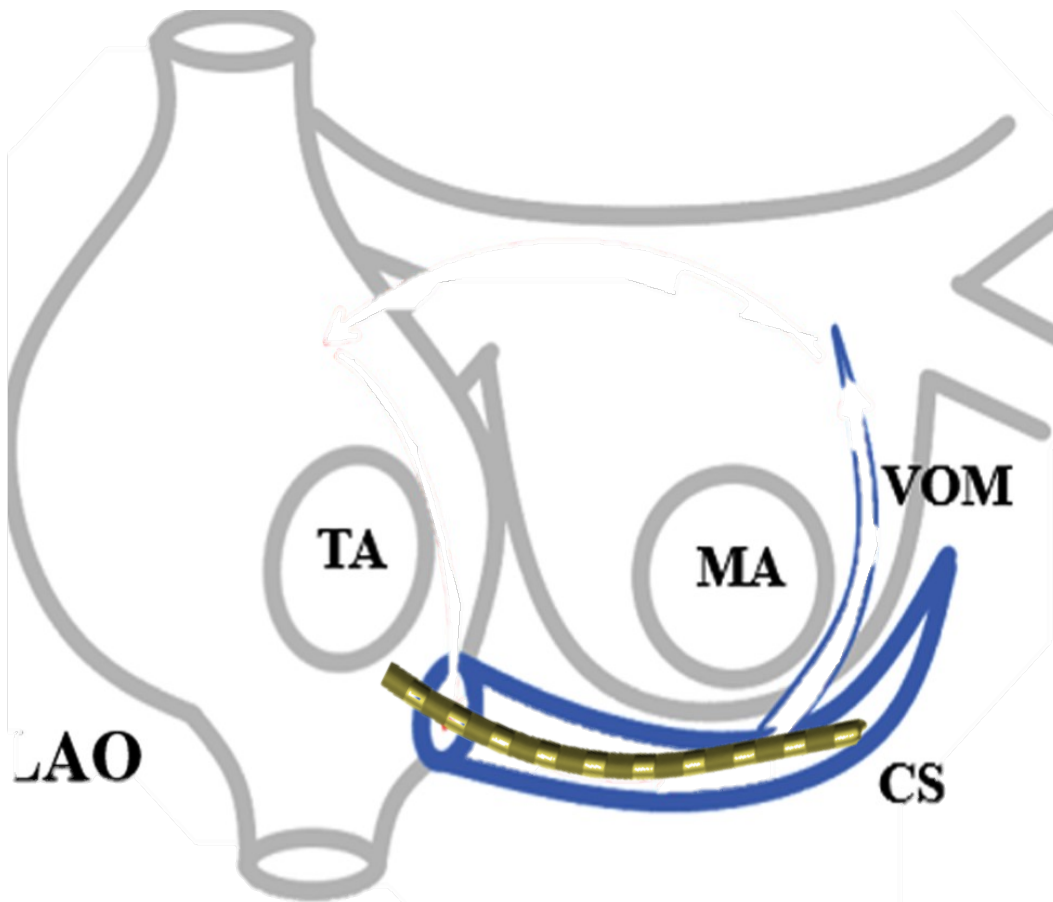


A: Focal atrial tachycardia from the lateral tricuspid annulus terminates with adenosine. B: In the same case as A, the electrogram at the successful ablation site shows a QS unipolar configuration with a sharp downstroke (on Lat TA 1 uni), which precedes other right atrial (RA) electrograms. RA electrograms are shown from a multipolar catheter looped around the lateral RA. C: Microreentrant tachycardia in a patient with prior ablation of AF. The tachycardia was localised to the anterior ridge between the left superior pulmonary vein and left atrial appendage. It was insensitive to adenosine. D: In the same case as C, multipolar Pentaray[®] catheter shows fragmented long-duration electrograms on two splines that encompass most of the tachycardia cycle length. CS = coronary sinus; dist = distal; lat = lateral; prox = proximal; TA = tricuspid annulus; uni = unipolar.

Focale vs réentrant

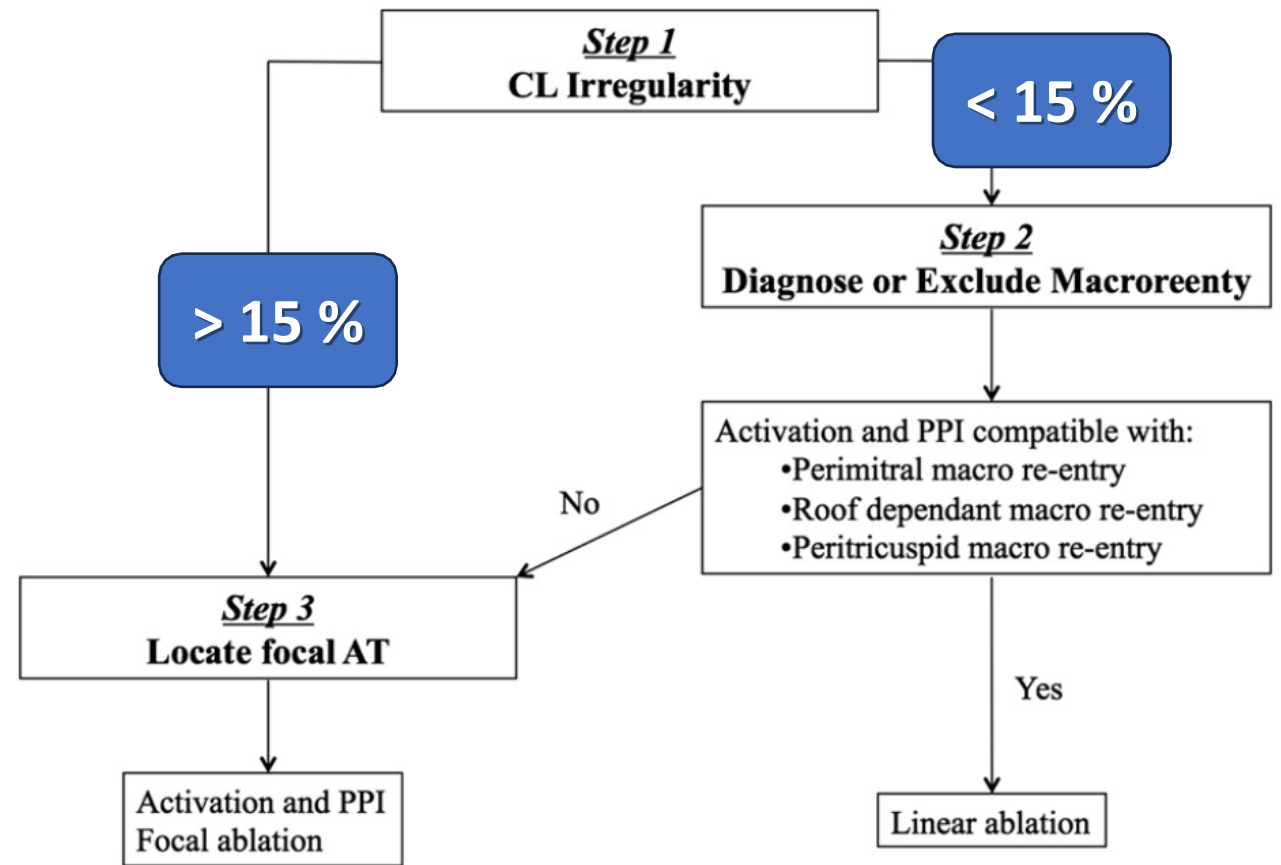
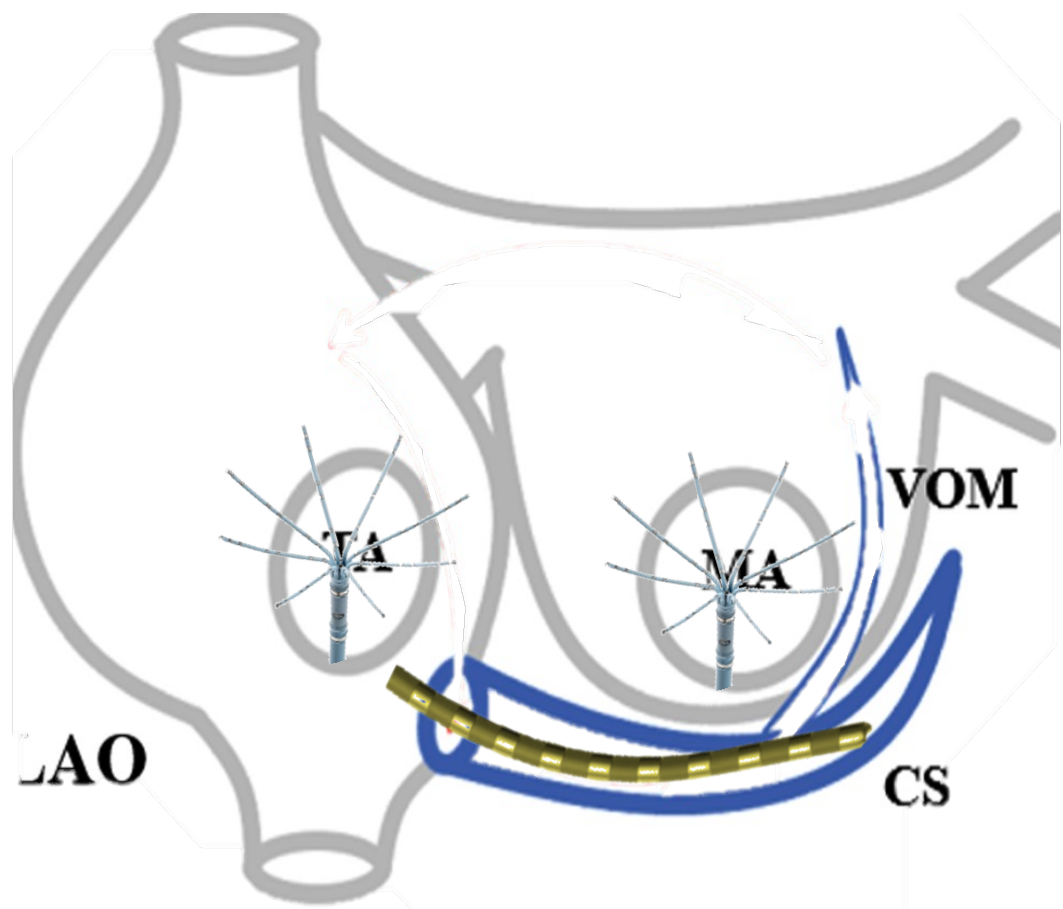


Cycle de la tachycardie





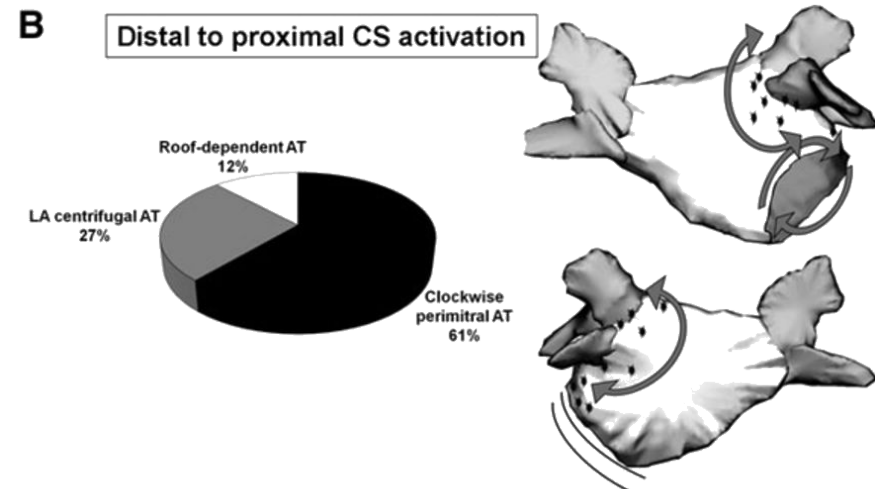
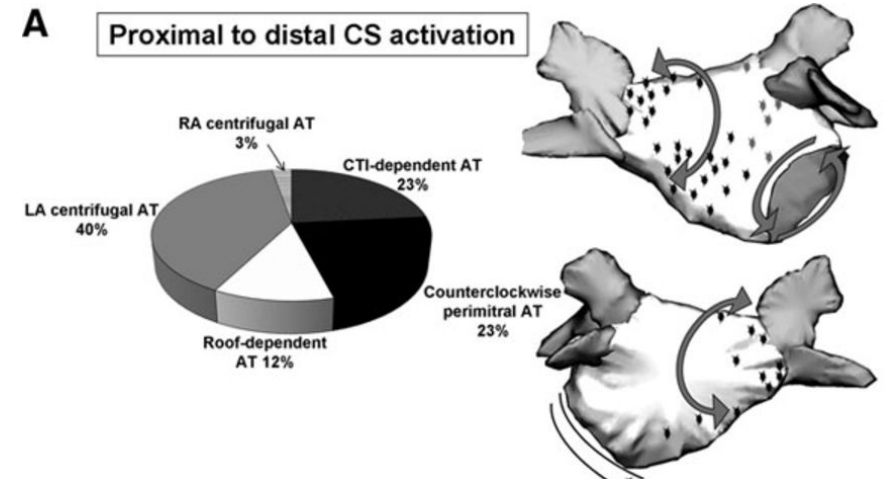
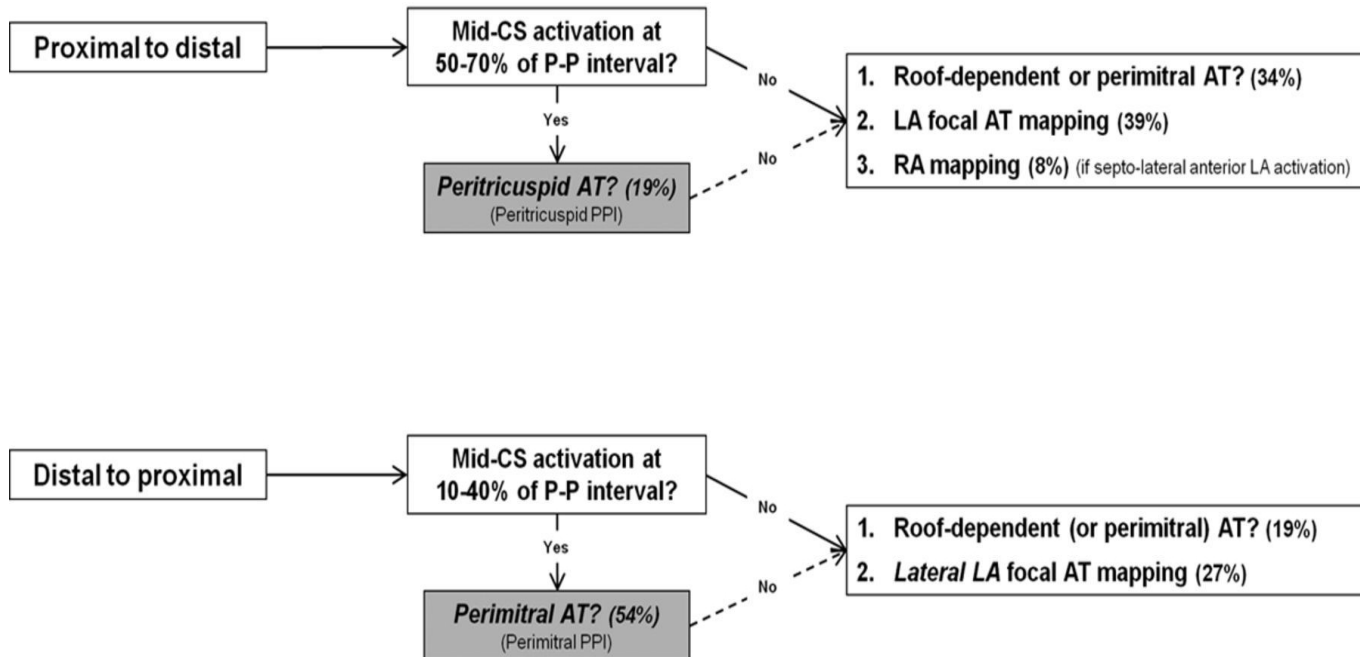
Focal vs réentrant





Focale vs réentrant

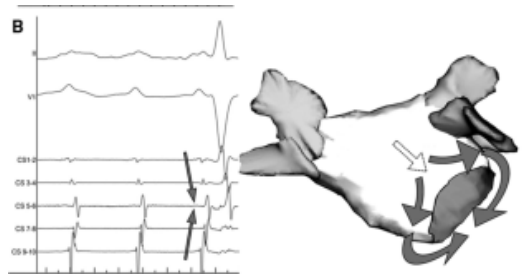
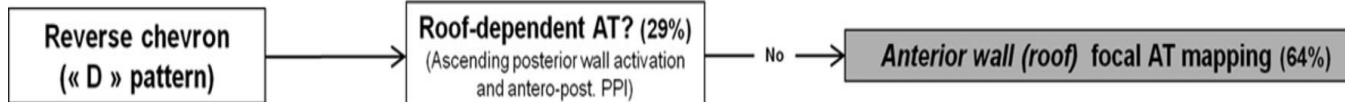
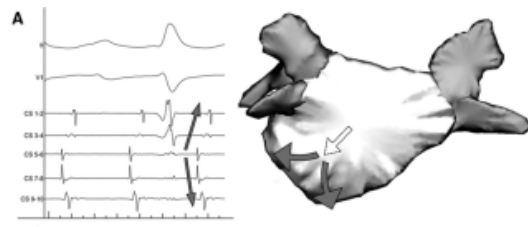
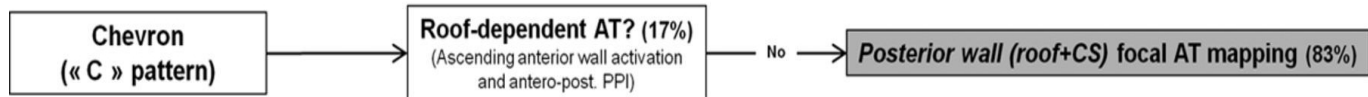
Coronary sinus activation



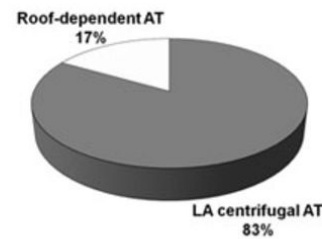


Focale vs réentrant

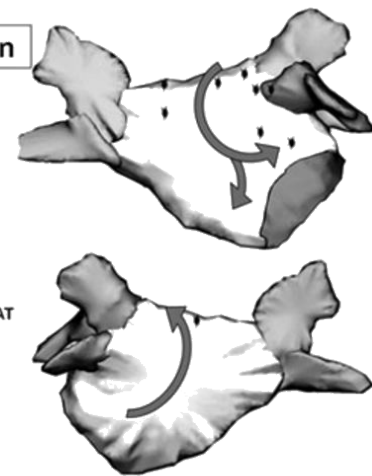
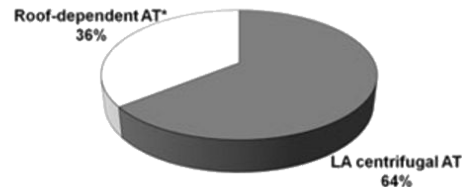
Coronary sinus activation



Chevron CS activation

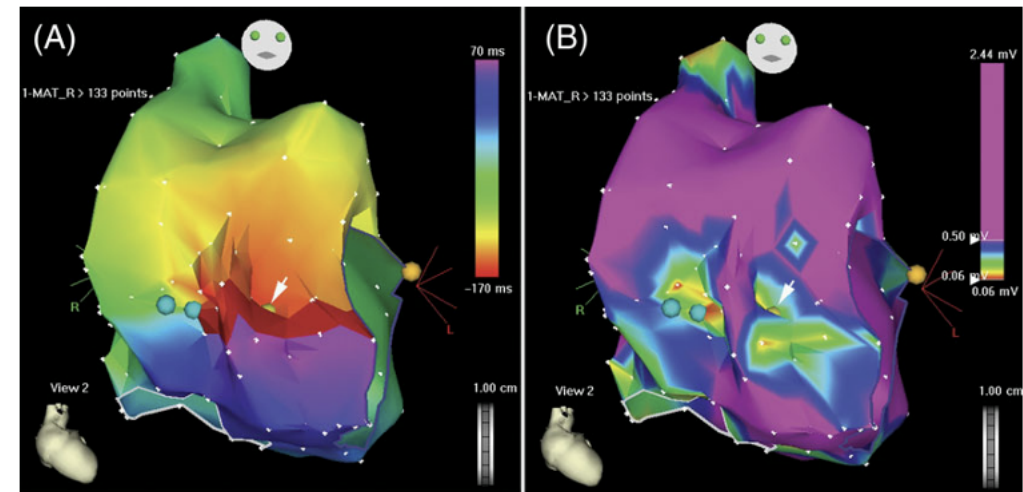
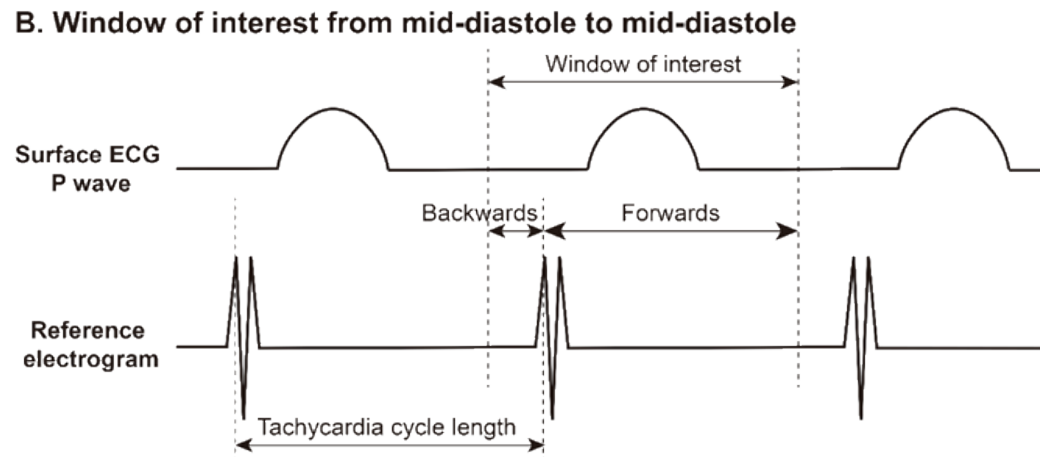


D Reverse chevron CS activation



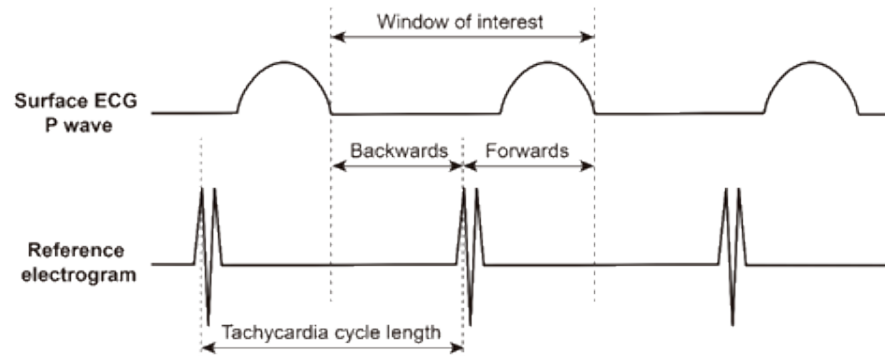
Réglage de la fenêtre d'intérêt

Méthode dite De Ponti

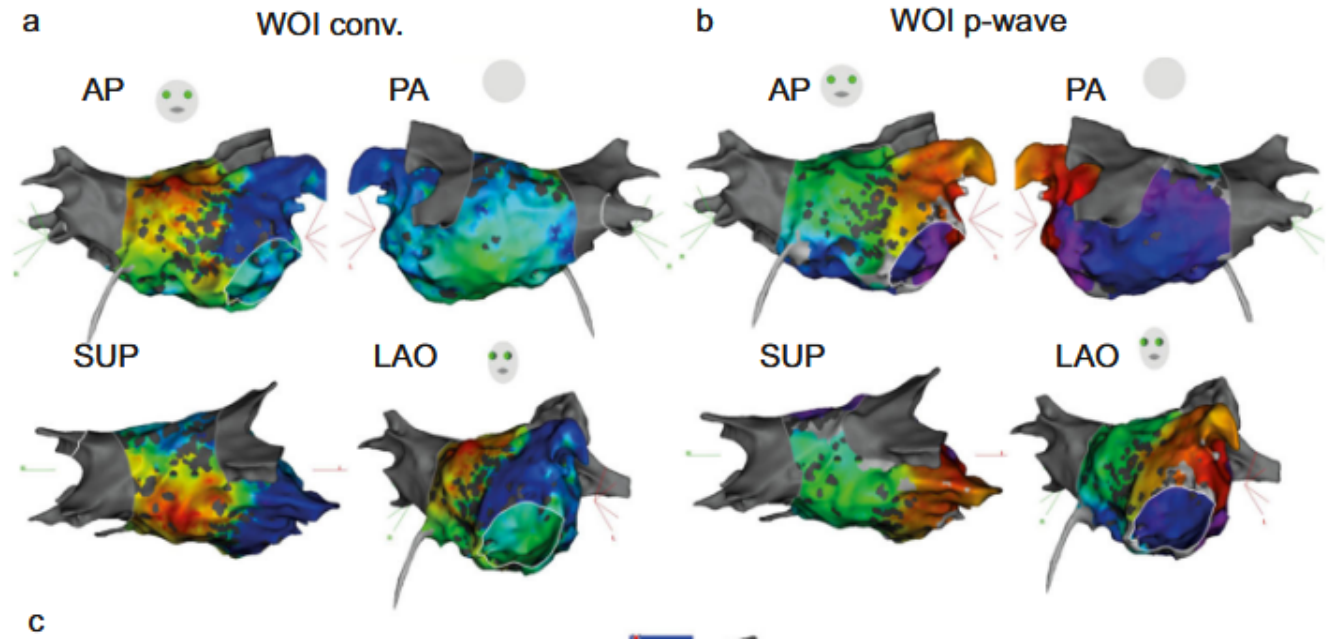


Réglage de la fenêtre d'intérêt

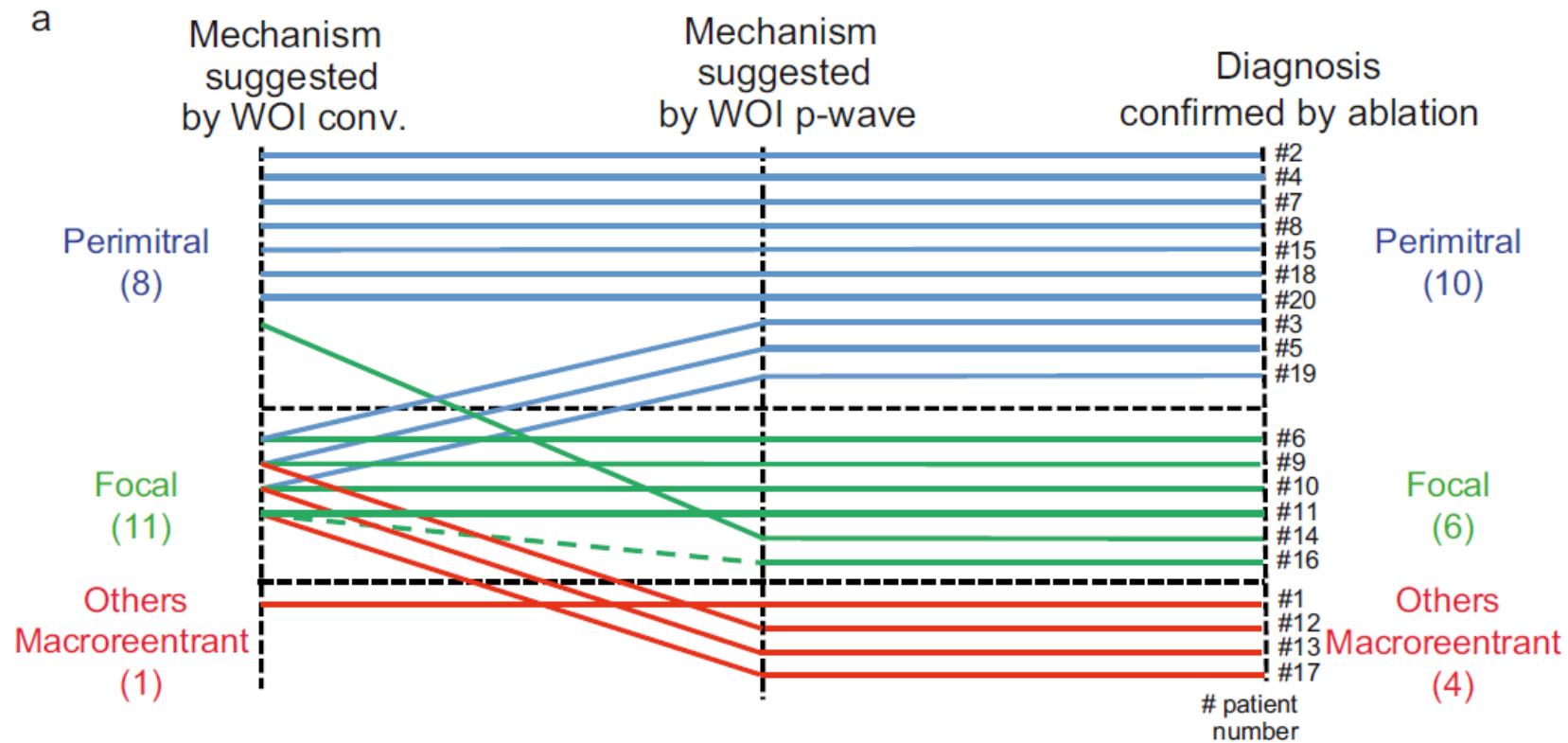
A. Window of interest from end to end of P wave



Pour les tachycardies atriales focales le début de l'onde P reflète la sortie anatomique du foyer d'où provient l'activation centrifuge

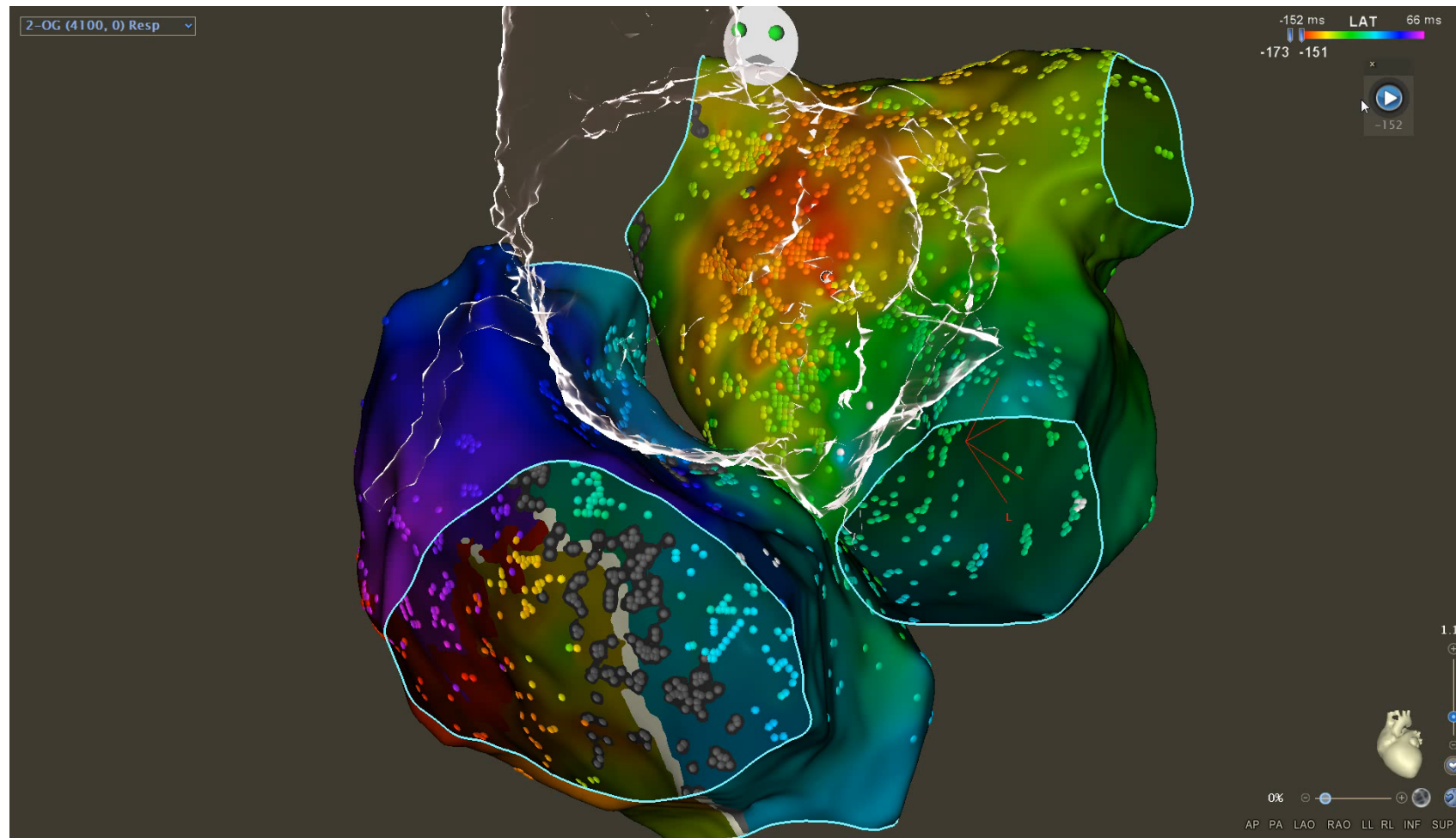


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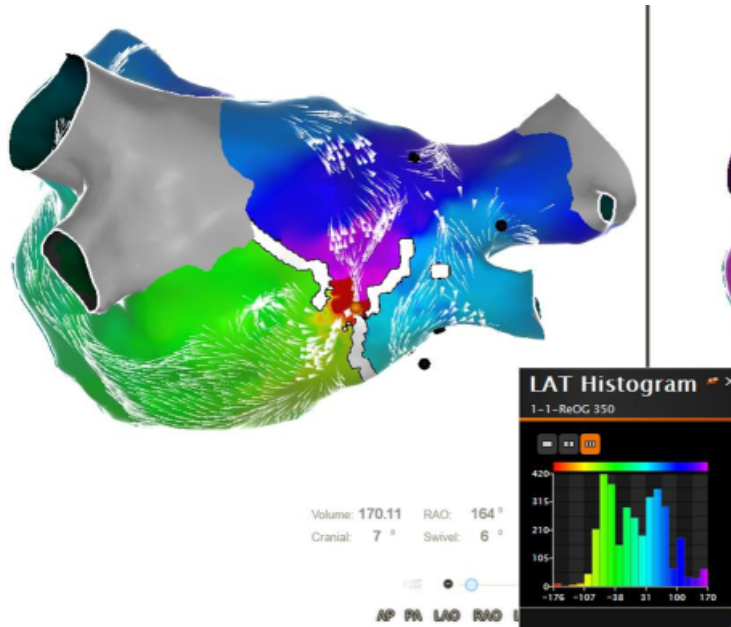
Carte d'activation haute densité



Carte d'activation

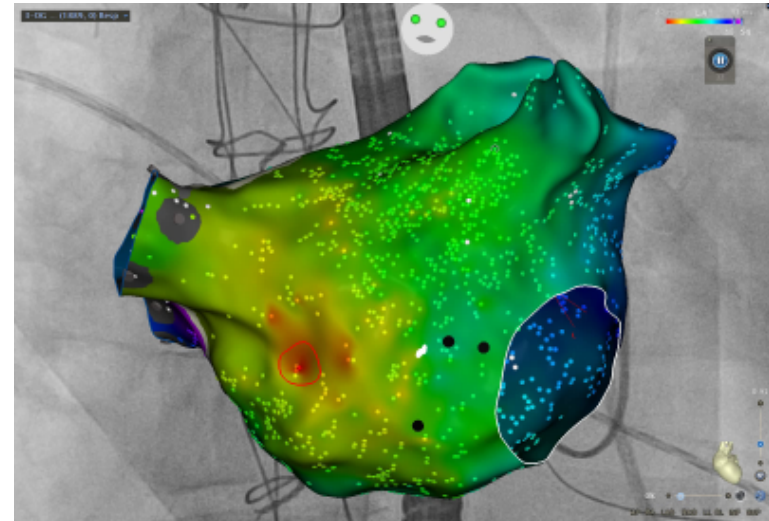
Carte de TA réentrante :

- early meets the latest site
- 90% du cycle dans la cavité explorée
- Si < 50% cycle il faut explorer l'autre oreillette



Carte de TA focale:

- Activité précoce en tache d'huile
- Carte d'au moins 60% du cycle avec des EGM précoces et tardifs distants.



Site d'ablation



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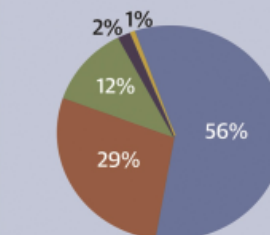
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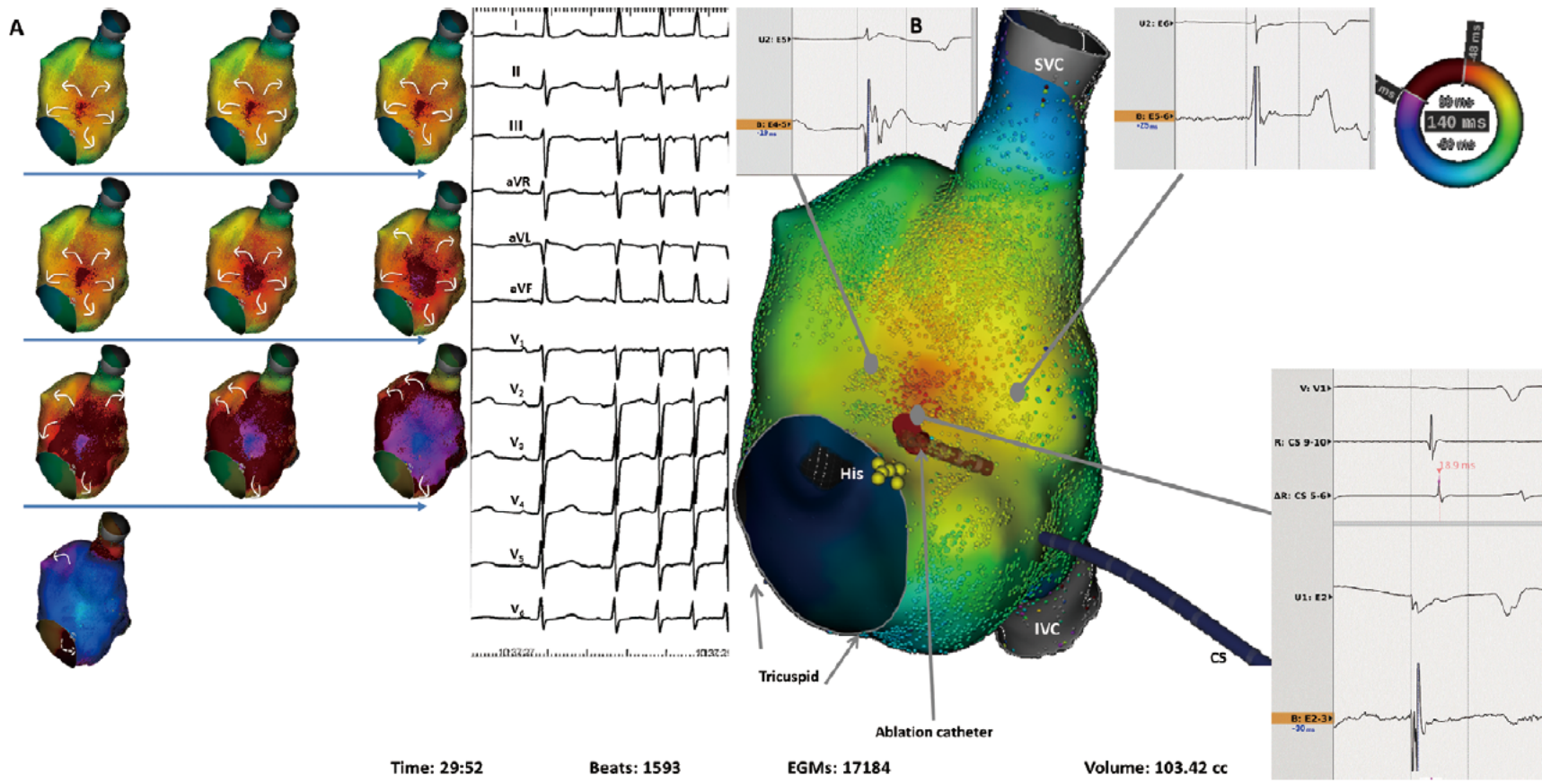
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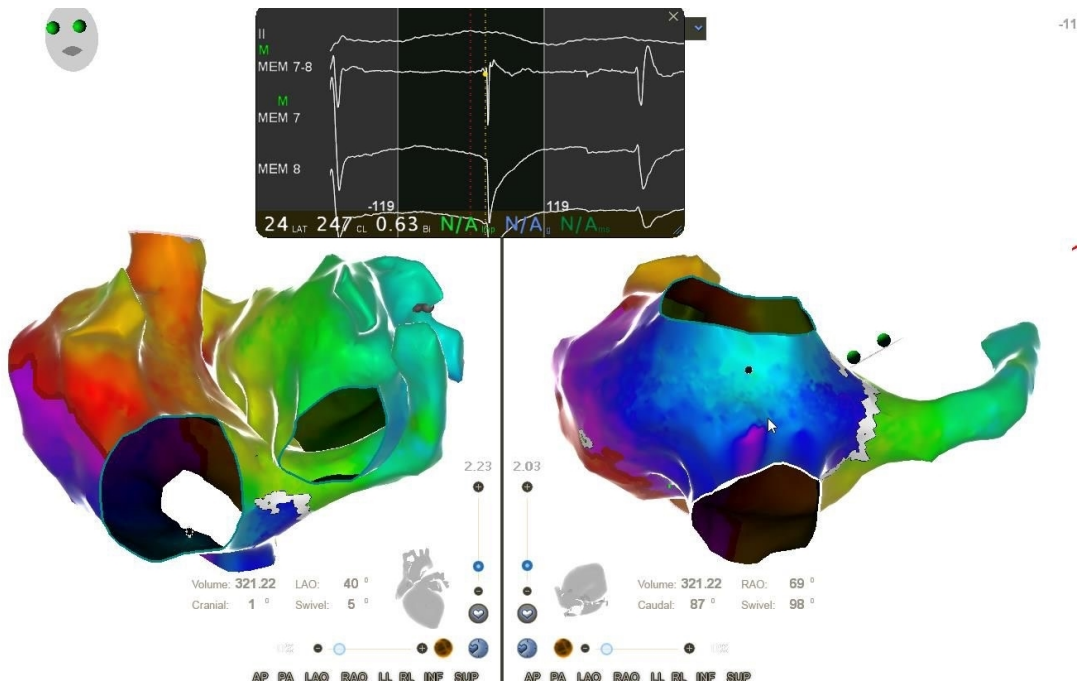




Carte d'activation



Potentiel local

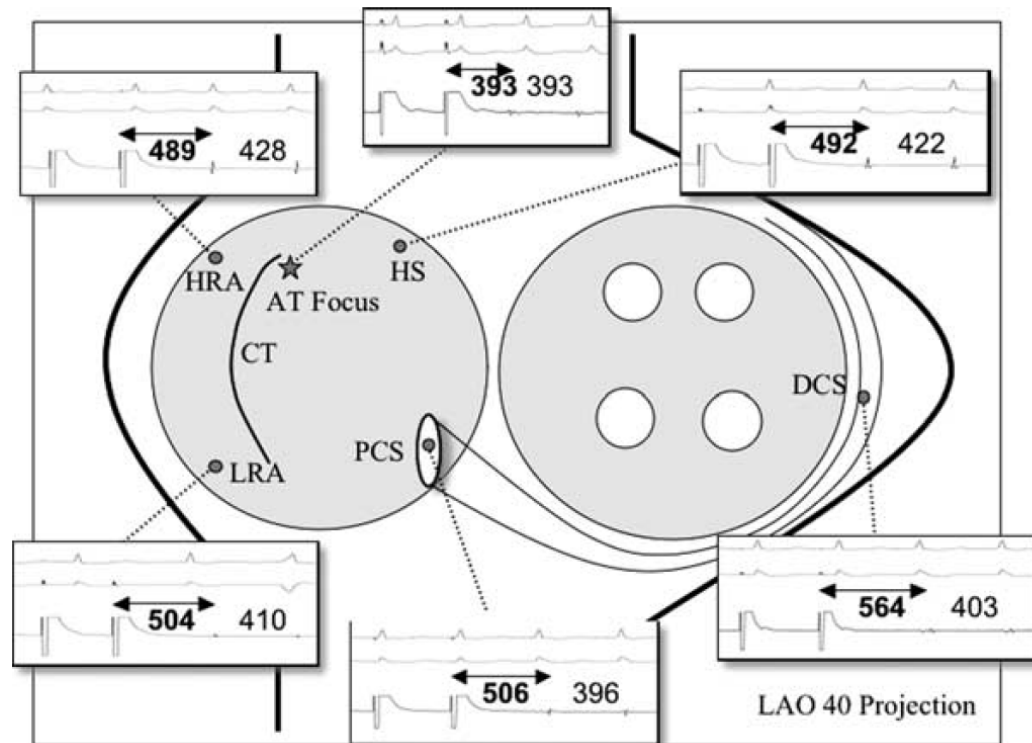


- Signal local > 50 -75% du cycle évoque une micro réentrée
- Signal local < 50% compatible avec un foyer
- Certaines localisations EGM fin de faible amplitude
- EGM unipolaire avec morphologie QS
- Prématurité locale au moins – 20 ms par rapport à l'onde P de surface

Entraînement des TA focales

A Novel Pacing Maneuver to Localize Focal Atrial Tachycardia

UWAIS MOHAMED, M.B.B.S., F.R.A.C.P., ALLAN C. SKANES, M.D., F.R.C.P.C.,
LORNE J. GULA, M.D., M.Sc., F.R.C.P.C., PETER LEONG-SIT, M.D., F.R.C.P.C.,
ANDREW D. KRAHN, M.D., F.R.C.P.C., RAYMOND YEE, M.D., F.R.C.P.C.,
RAJESH SUBBIAH, M.B.B.S., Ph.D., F.R.A.C.P., and GEORGE J. KLEIN, M.D., F.R.C.P.C.



Plusieurs conclusions “proof of concept” :

- Le temps de conduction perifocal du foyer atrial est court
- Utilité de l’entraînement pour déterminer la proximité du foyer

Entraînement des TA focales

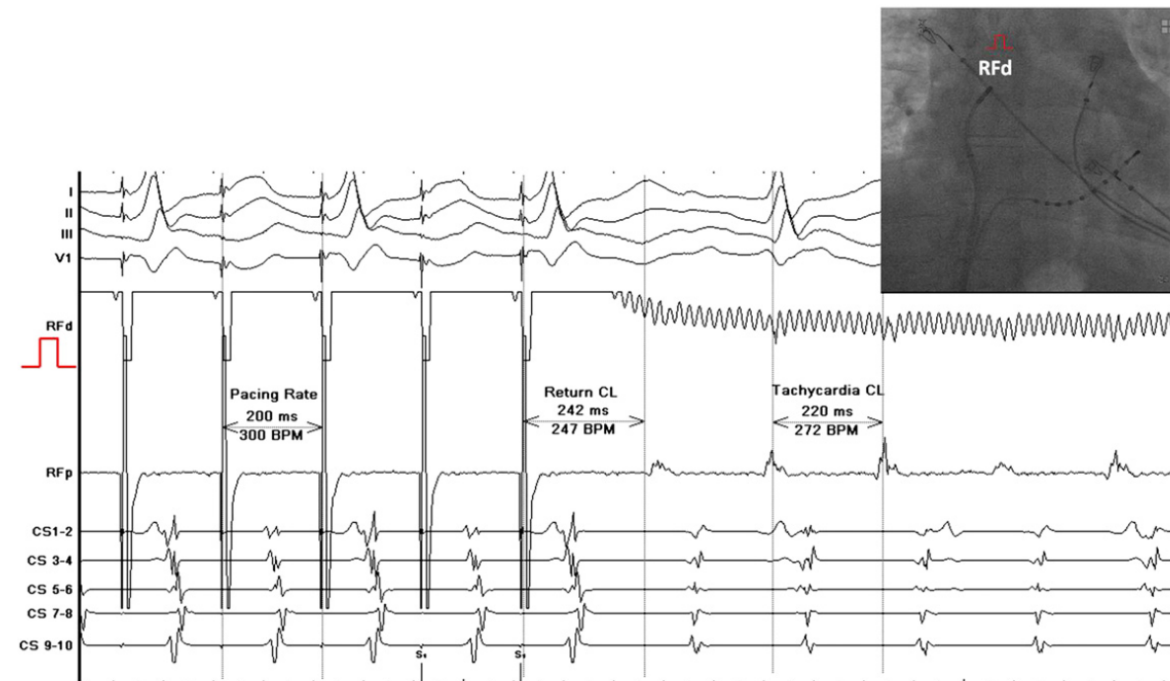


Fig. 8. Confirming the source of origin of the atrial tachycardia using entrainment (postpacing interval <30 milliseconds). CL, cycle length.

Pendant l'entraînement des TA focales :

- l'analyse du PPI peut aider à localiser le site d'origine de la tachycardie
- PPI < 30 ms traduit la proximité de la source
- PPI > 50 ms site à distance du foyer

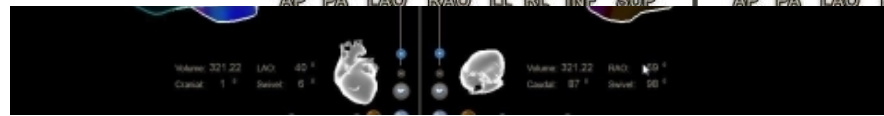
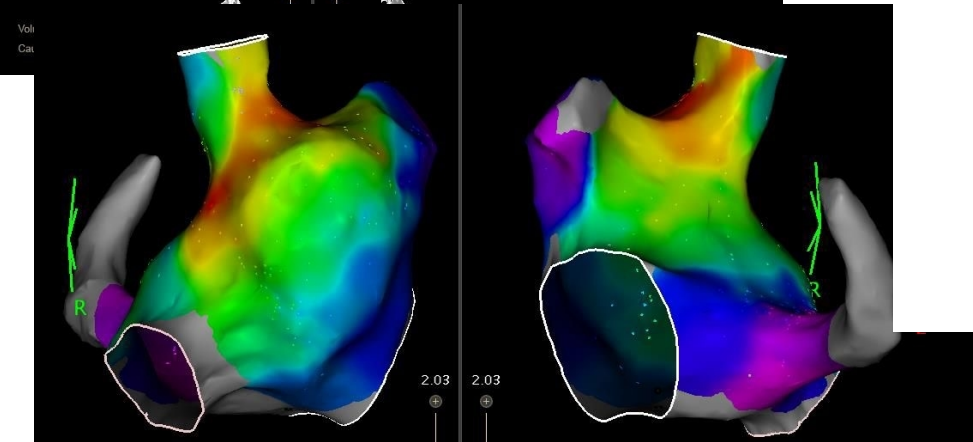
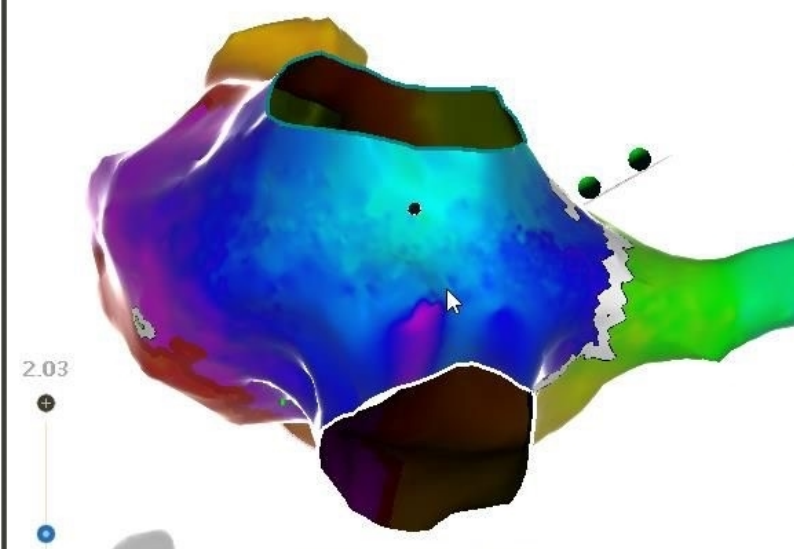
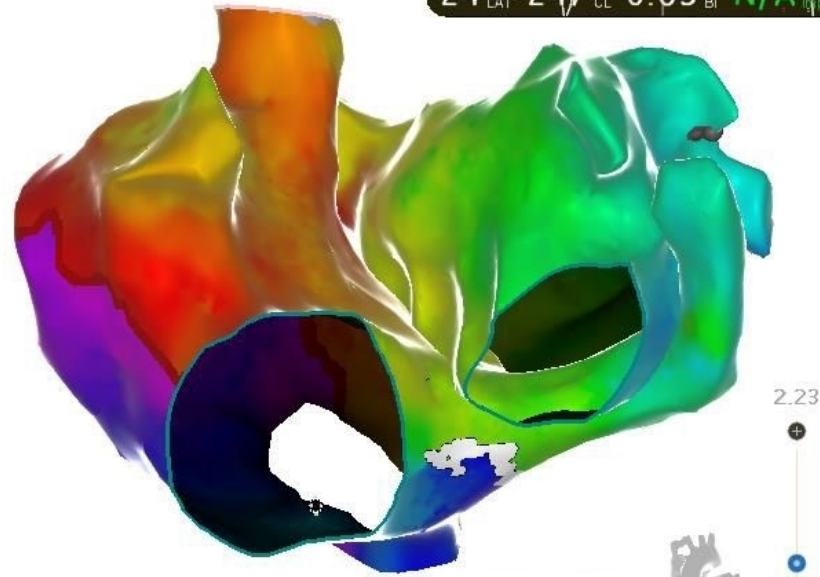
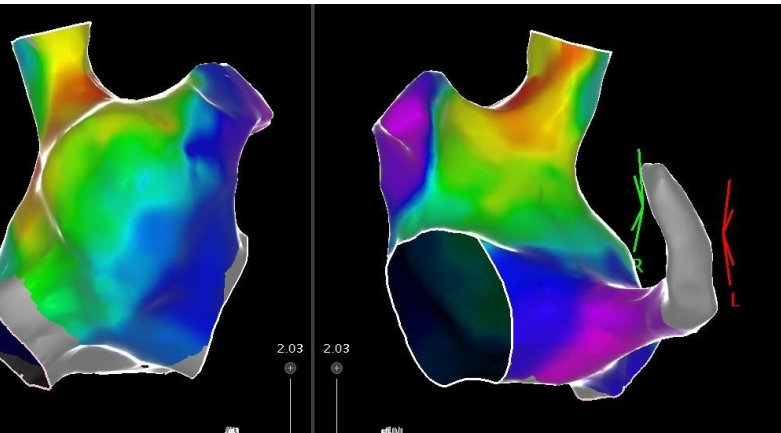
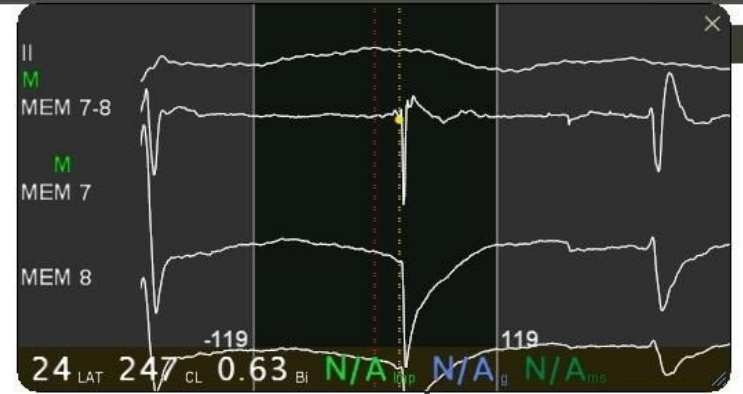
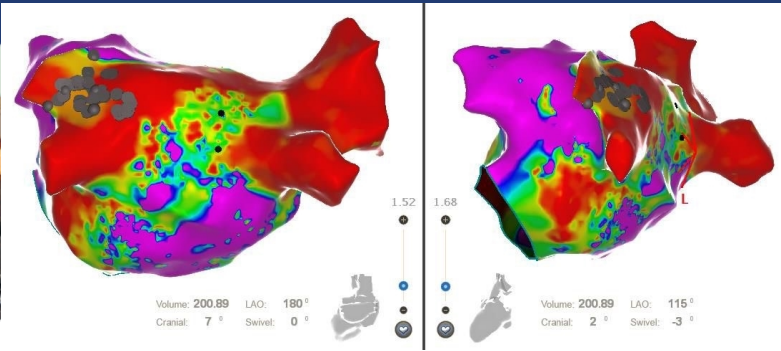
Contrairement au tachy reentrante le PPI < 30 ms ne peut pas se retrouver dans une région loin du foyer de la TA.



Conclusion

Cartographie des tachycardies atriales focales:

- mécanisme rare de tachycardie atriale
- l'étude de la stabilité du cycle et de l'activation dans le SC guide la stratégie de cartographie
- L'ajustement de la fenêtre d'intérêt permet de mettre en relief la primo-activation centrifuge
- on peut s'aider de manoeuvre d'entraînement sur le site de potentiel QS précoce





Potentiel local



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Réglage de la fenêtre d'intérêt



Réglage de la fenêtre d'intérêt



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Physiology of Atrial Tachycardias

ATs are driven by abnormal electrical activity that bypasses the usual pacemaker function of the SA node. The physiological mechanisms of AT include:

- Enhanced automaticity: atrial cells outside the SA node spontaneously depolarize faster than the SA node, overriding its pacemaking function. This automatic firing can lead to focal AT (unifocal AT), where electrical impulses arise from a single location.
- Triggered activity: abnormal calcium handling within atrial cells can cause delayed afterdepolarizations, leading to rapid, triggered electrical discharges. This process occurs after an action potential, particularly when cells are exposed to excessive sympathetic stimulation or ischemia, creating bursts of rapid atrial beats.



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During entrainment of the focal tachycardia, analysis of the postpacing interval (PPI) can also be used to progressively approach the site of origin of the tachycardia as described by Mohamed and colleagues.⁵ A PPI less than or equal to 30 milliseconds is considered as indicative of the proximity of the pacing site to the tachycardia source. In the presence of PPI exceeding the cycle length more than 50 milliseconds, entrainment should be performed from another segment of the atrium.

Conversely to the characteristics of macro reentry, PPI less than or equal to 30 milliseconds cannot be found in more than 1 atrial segment for focal AT. In other words, the atrial segment with PPI less than or equal to

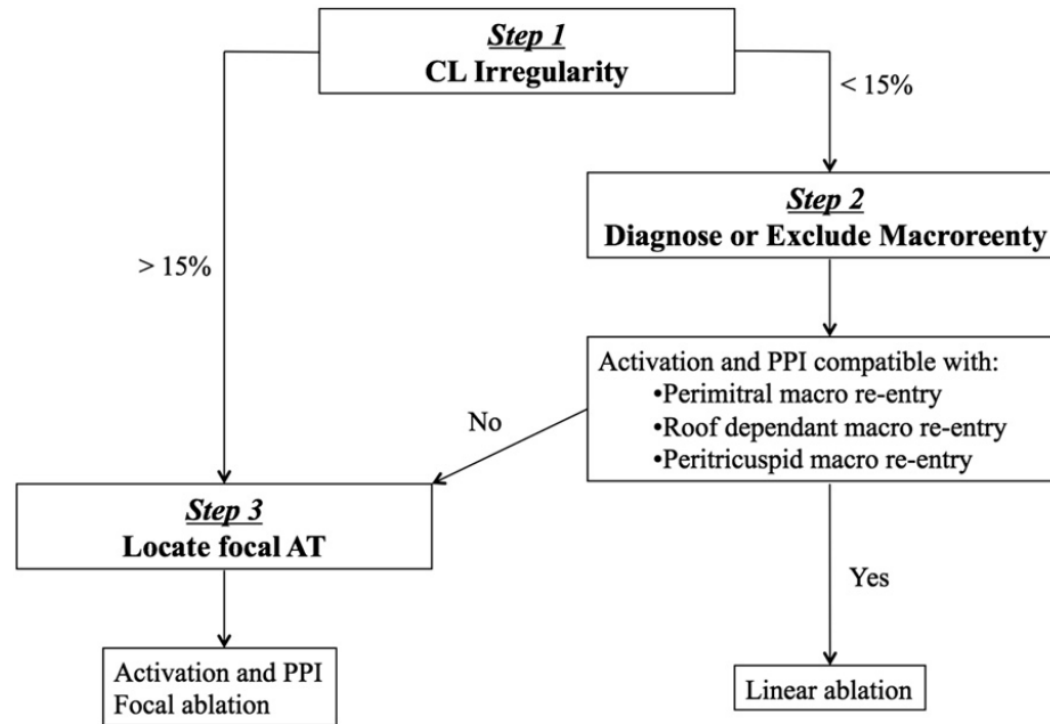
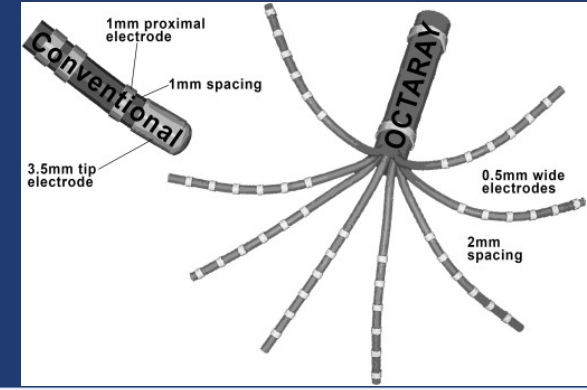


Fig. 2. Deductive mapping steps. Three deductive steps for mapping and ablation of AT in the context of persistent AF ablation.



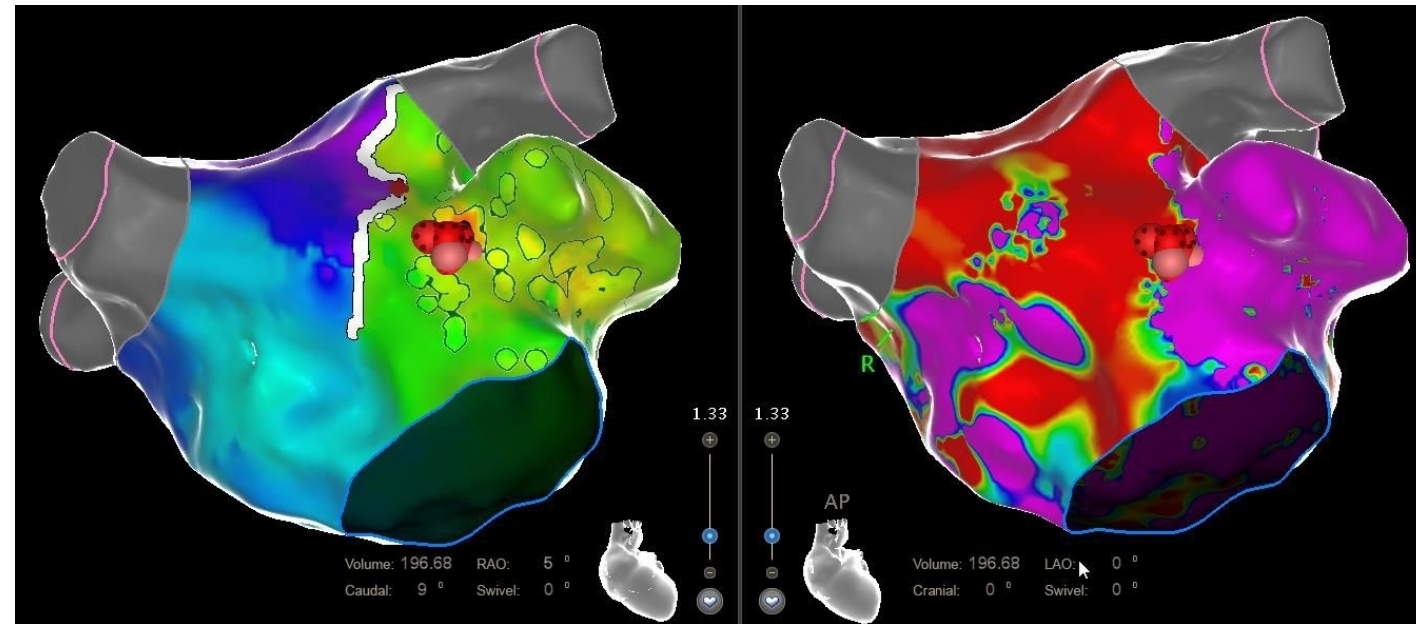
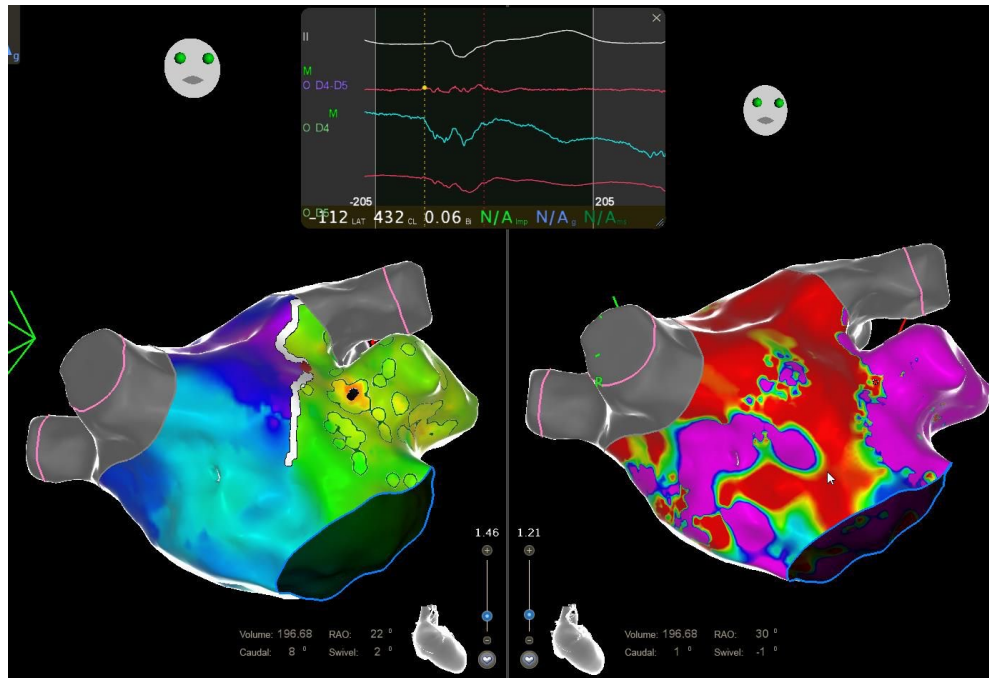
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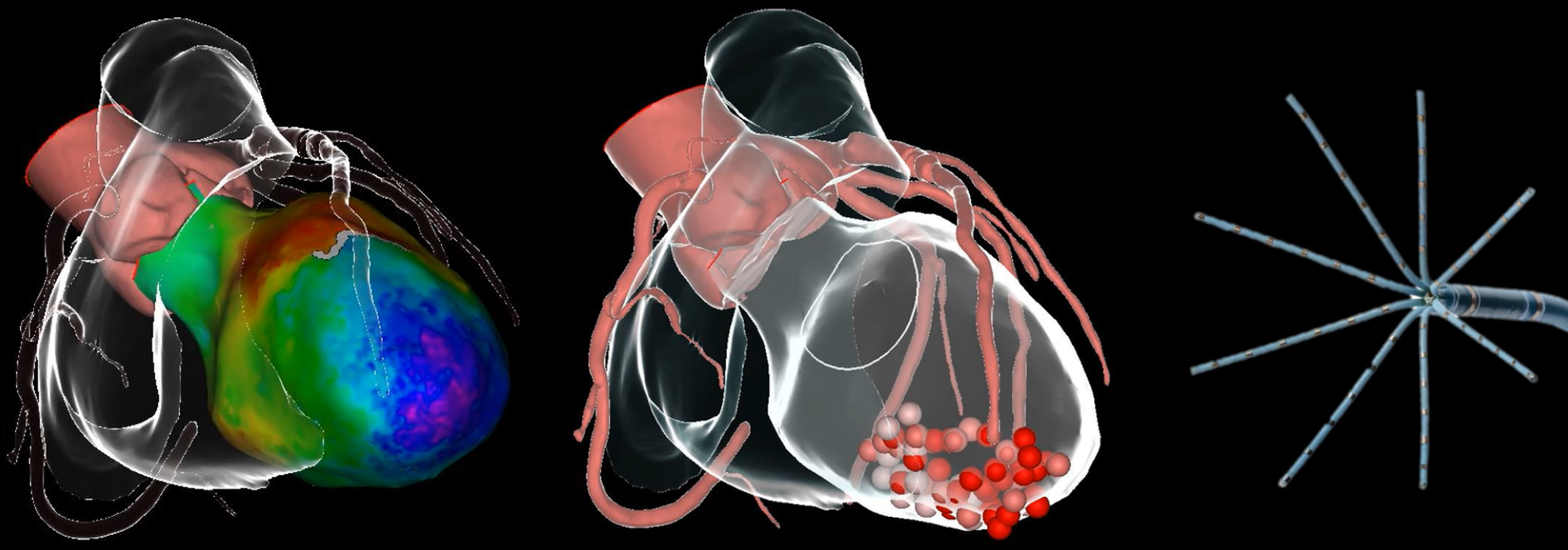
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Ablation de TV – Mapping du substrat dans le cadre d'une cardiomyopathie ischémique

Dr. Xavier Waintraub – 05/03/2025





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On the contrary, focal arrhythmias show the pattern in which the earliest activation site is surrounded concentrically by those with subsequent activation (Fig. 5). The activation map typically spans less than 60% of the tachycardia cycle length, and the latest site usually does not meet the earliest site.