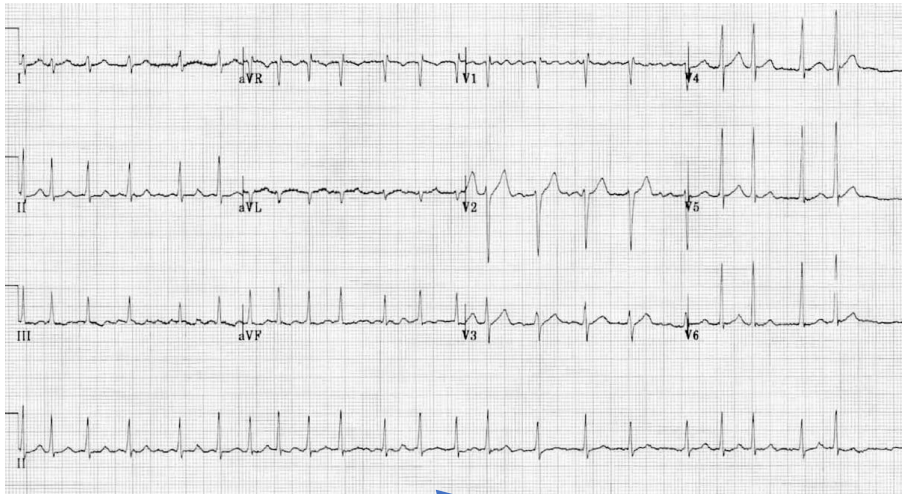
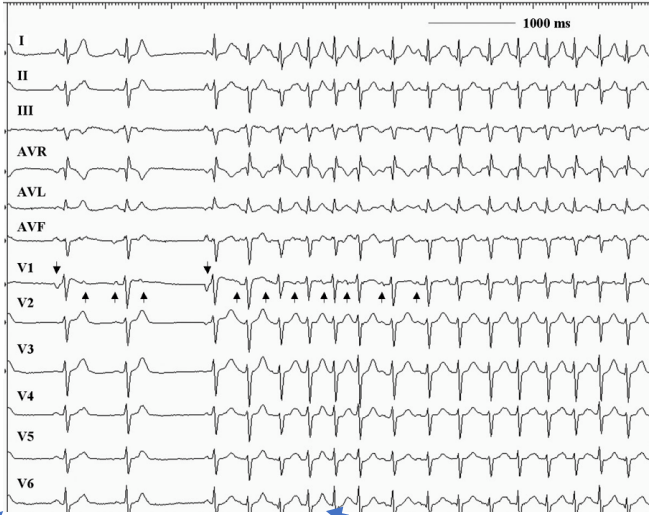


# L'ablation de fibrillation atriale, différentes stratégies

B. MAILLE

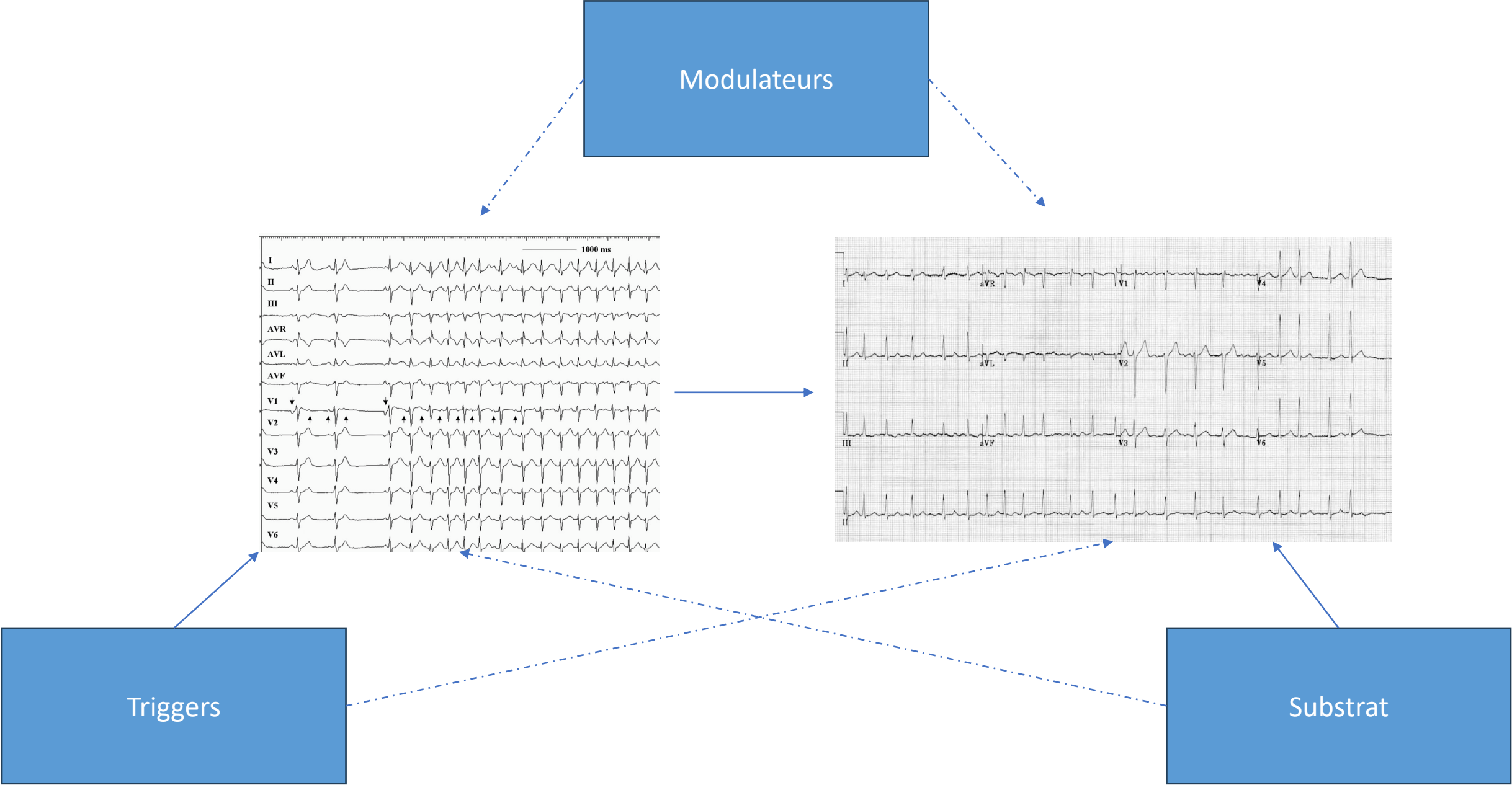
CHU La Timone, Marseille

Modulateurs

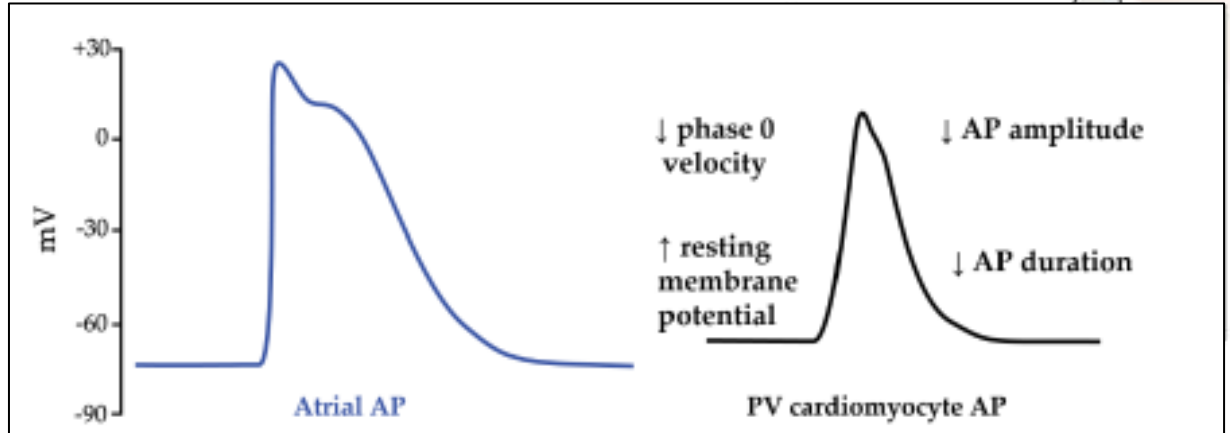
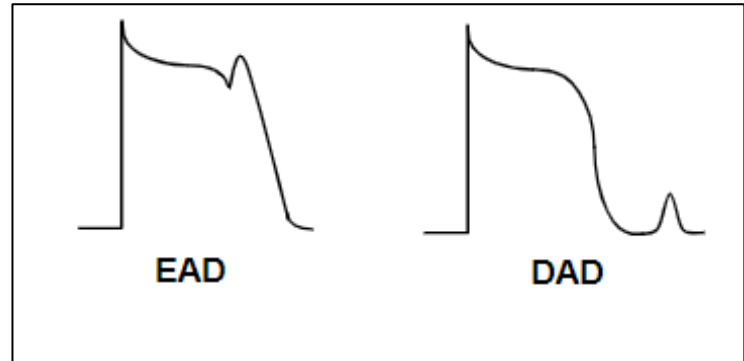
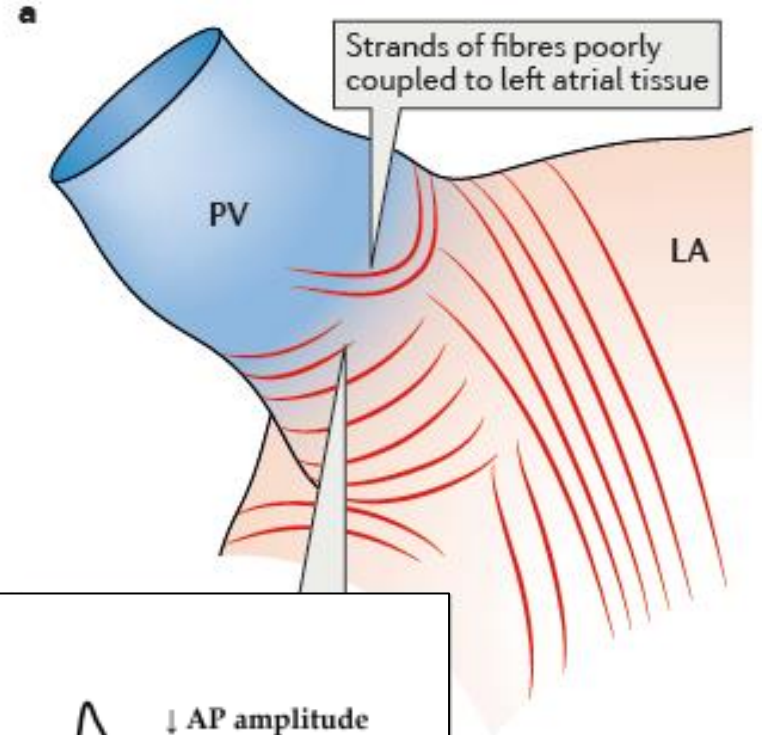


Triggers

Substrat

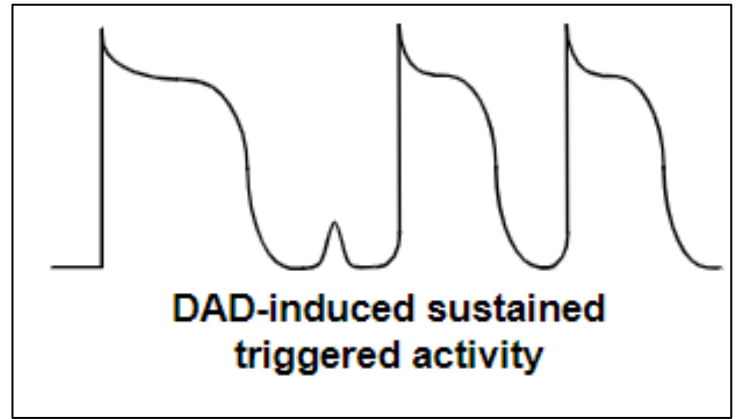


# Atrial Fibrillation Triggers



**PV ion currents/APs:**

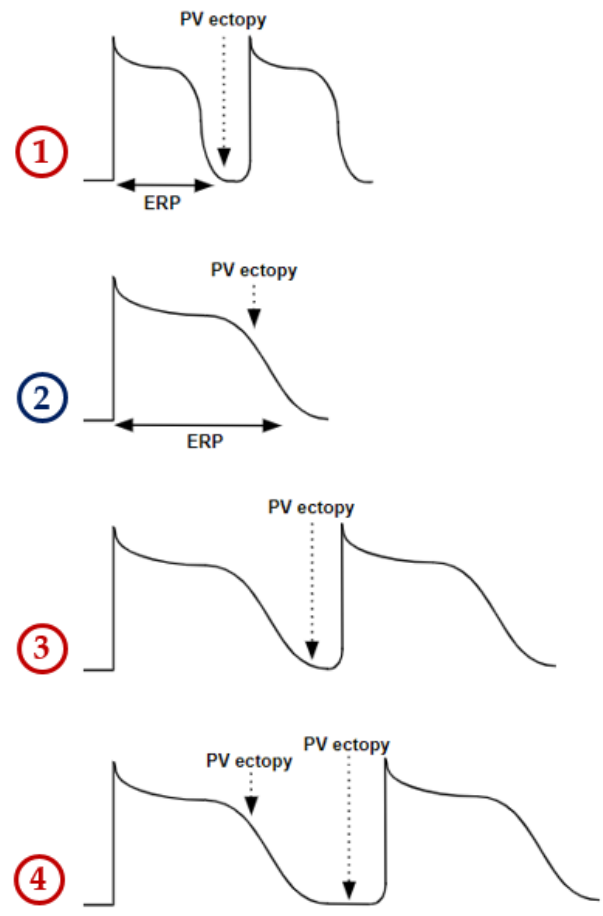
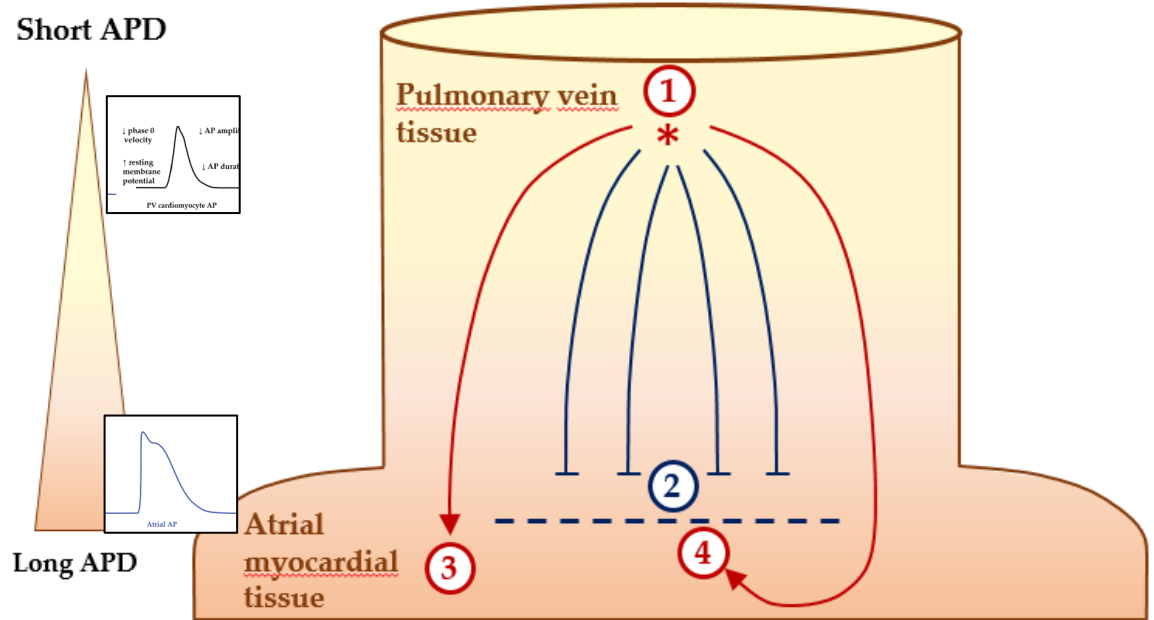
- Small  $I_{K1}$ , reduced RMP
- Small  $I_{CaL}$ , larger  $I_{Kr/Ks}$ , reduced AP duration



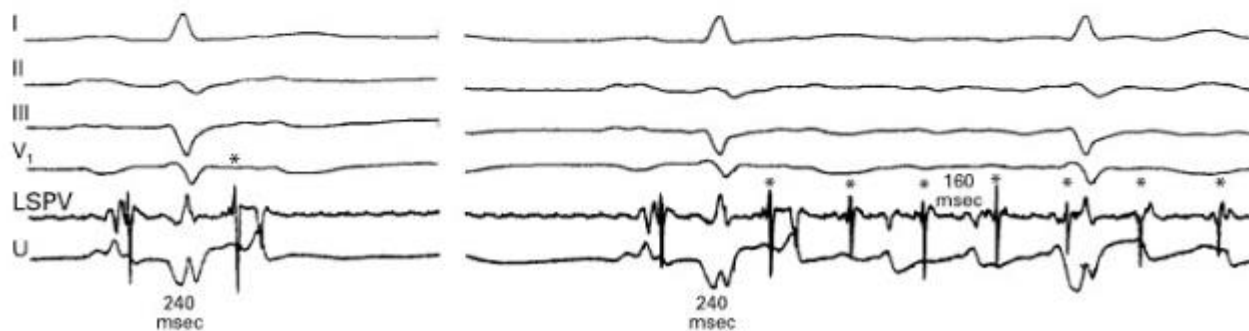
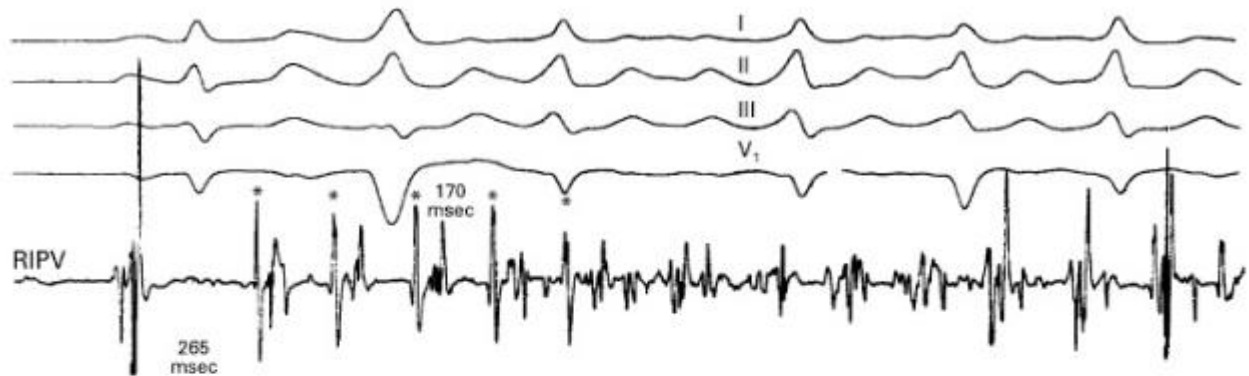
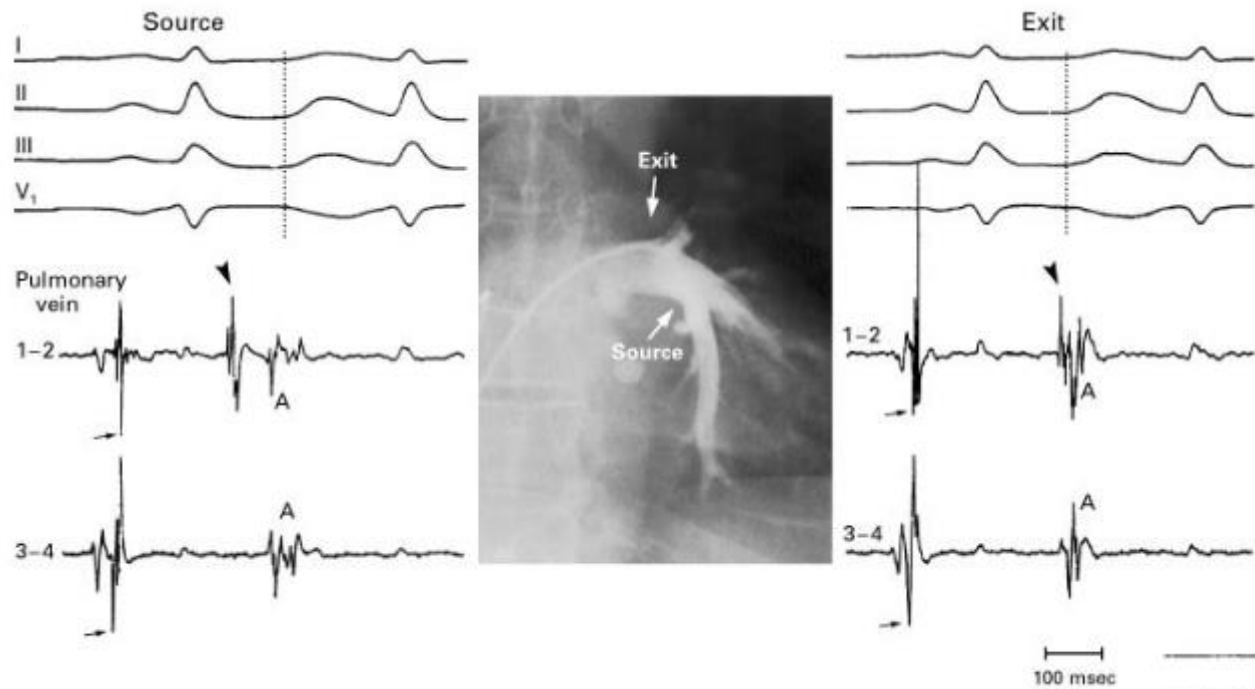
**DAD-induced sustained triggered activity**

Modified from Nattel, Stanley, and Dobromir Dobrev. 'Electrophysiological and Molecular Mechanisms of Paroxysmal Atrial Fibrillation'. *Nature Reviews Cardiology* 13, no. 10 (October 2016): 575–90. <https://doi.org/10.1038/nrcardio.2016.118>.

# Functional Reentry



Triggers

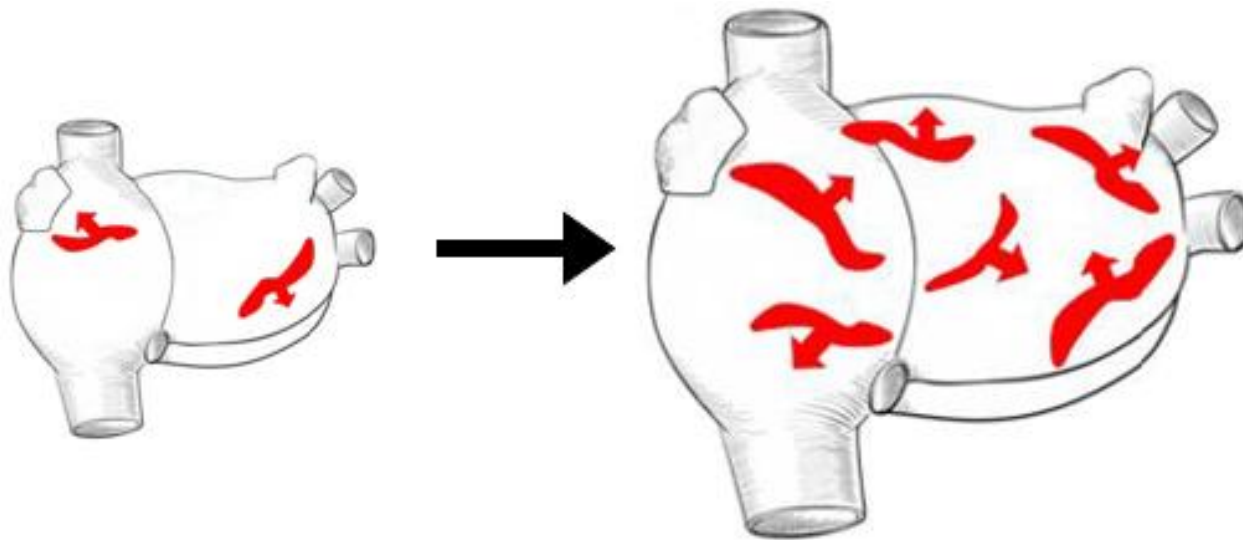


Haïssaguerre, M., P. Jaïs, D. C. Shah, A. Takahashi, M. Hocini, G. Quiniou, S. Garrigue, A. Le Mouroux, P. Le Métayer, et J. Clémenty. « Spontaneous Initiation of Atrial Fibrillation by Ectopic Beats Originating in the Pulmonary Veins ». *The New England Journal of Medicine* 339, n° 10 (3 septembre 1998): 659-66. <https://doi.org/10.1056/NEJM199809033391003>.

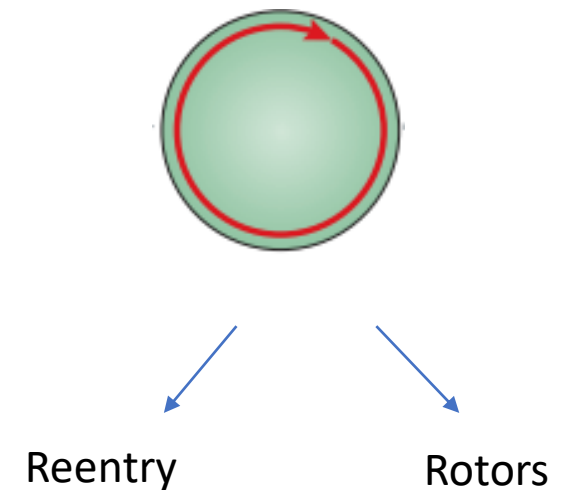
# Mécanismes de perpetuation de la fibrillation atriale

Substrat

Left atrium critical mass

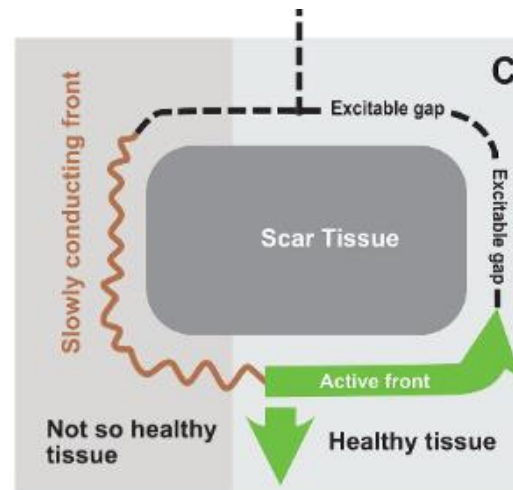
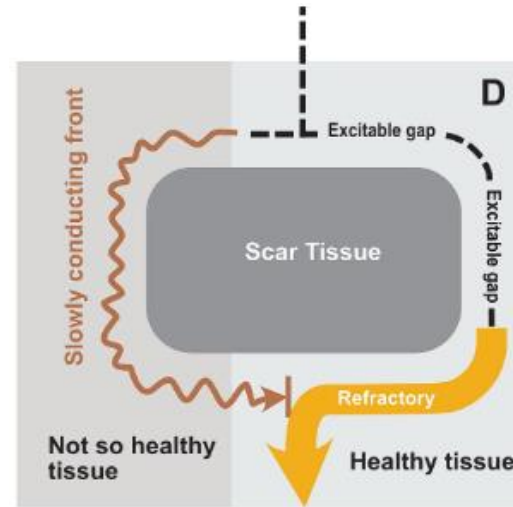
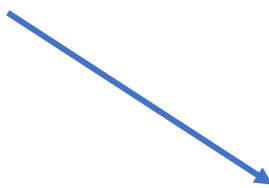
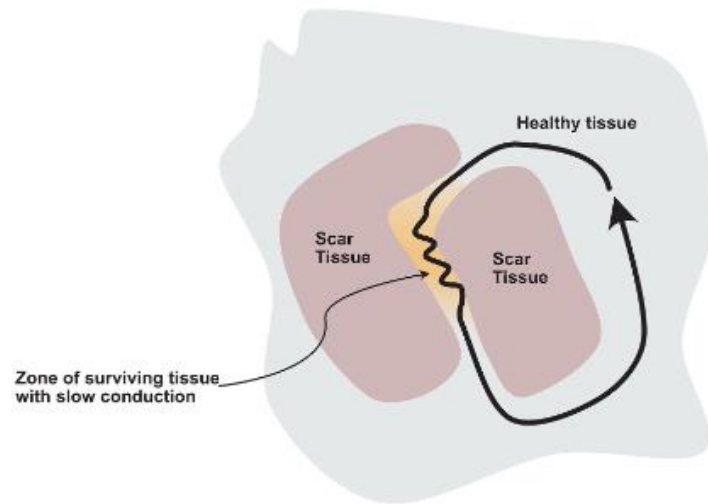


AF Drivers



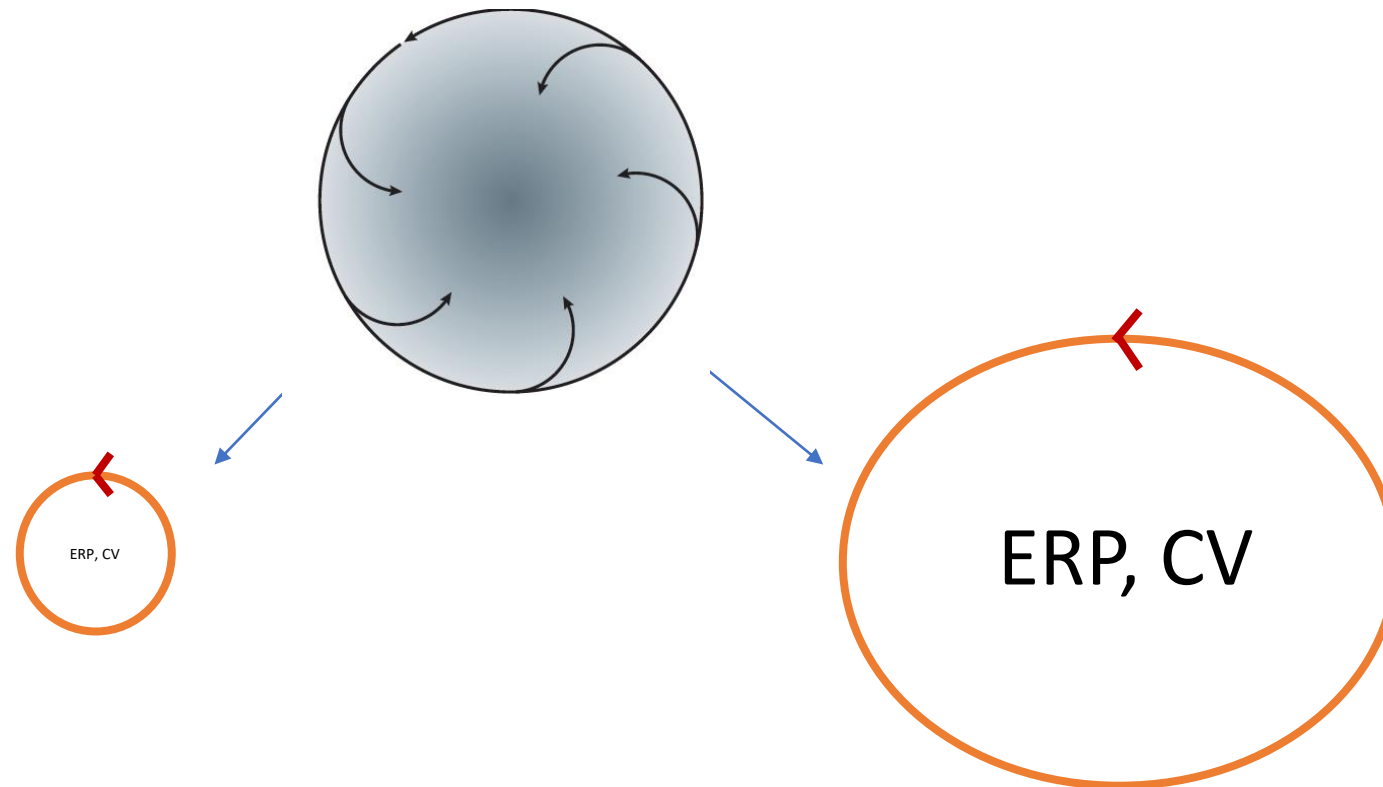
# Anatomical Reentry : fibrosis

Substrat



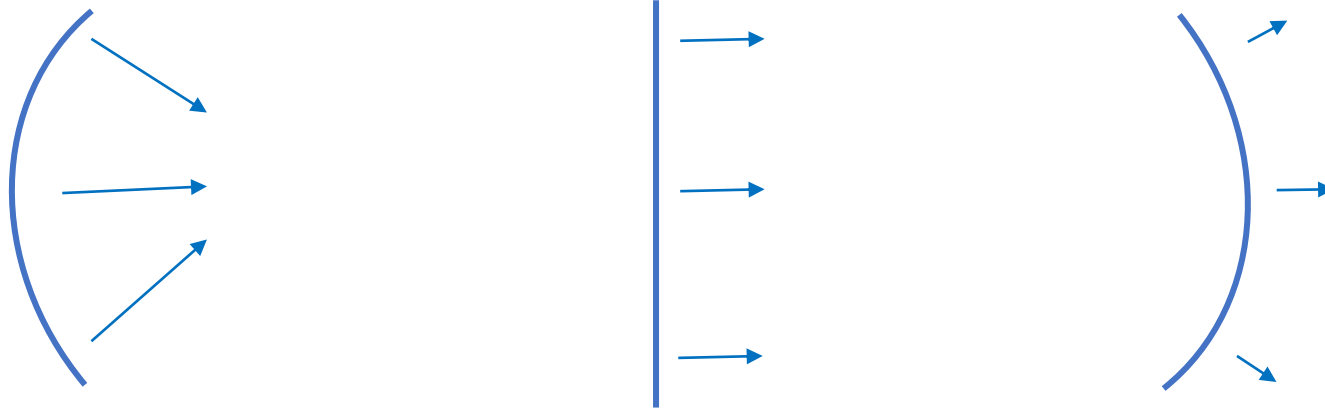
# Electrical remodelling: Wavelength of functional reentry

= shortest path length defined by the distance travelled in one refractory period (**ERP x conduction velocity**)





# Effect on wave front curvature on conduction velocity



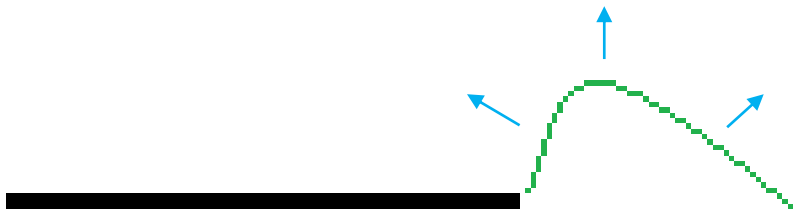
**Conduction velocity decrease with convexity**

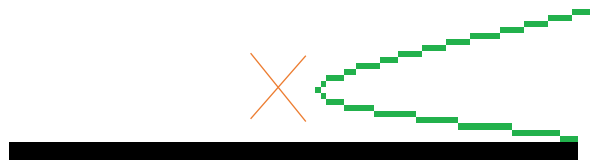
**Wave front** = conduction velocity x duration of upstroke AP











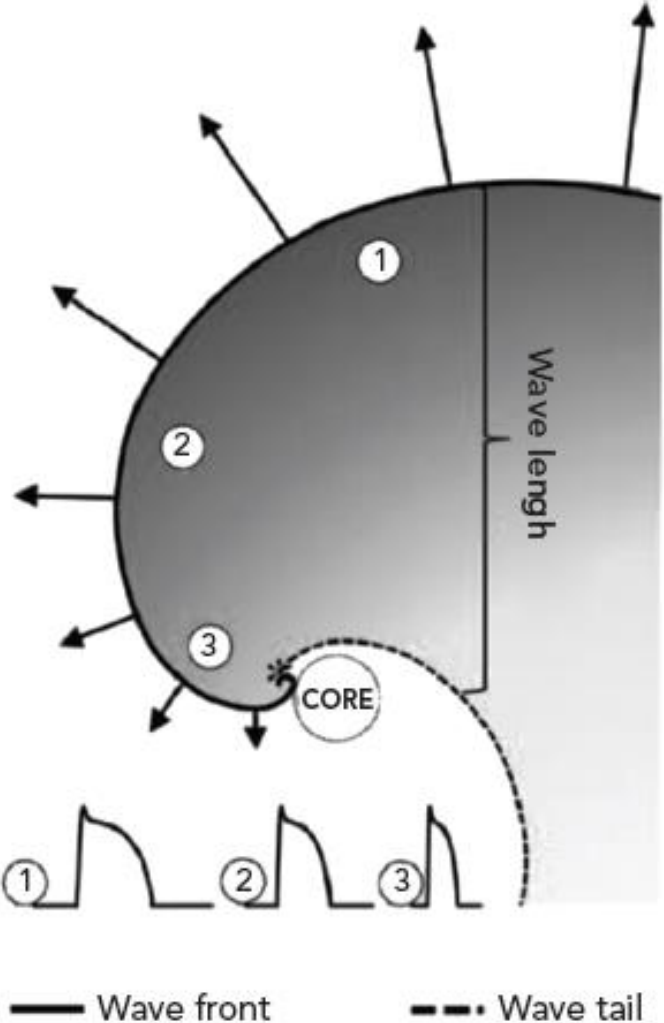


**Conduction velocity = 0** (if convexity ++++)

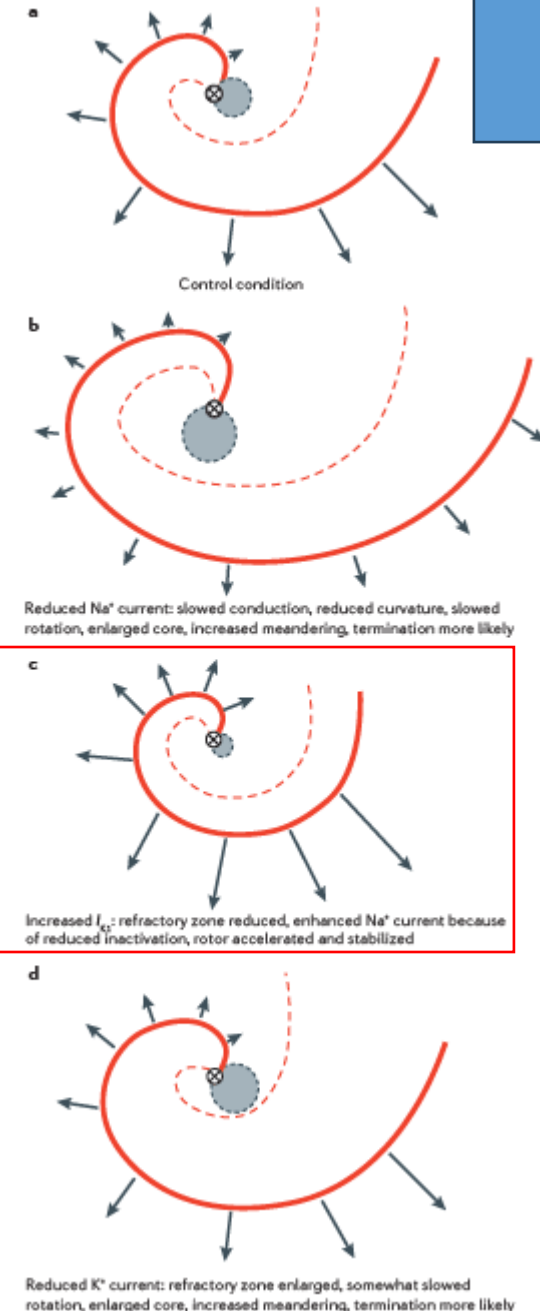
→ critical radius for propagation in cardiac tissue  $R_{crit} = 1\text{mm}$

→ Phase singularities

# Rotors



Substrat

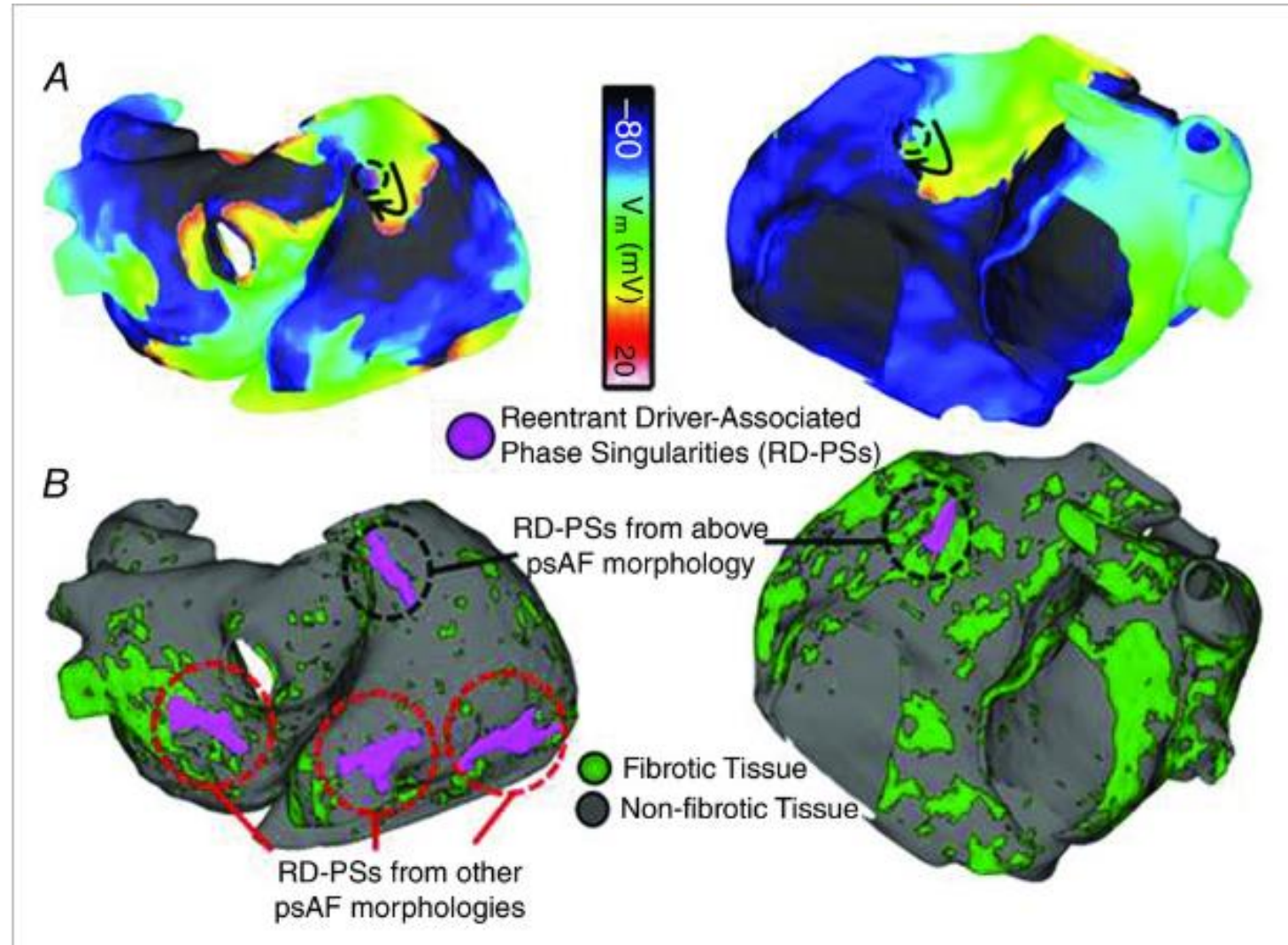


Nattel, Stanley, Feng Xiong, and Martin Aguilar. 'Demystifying Rotors and Their Place in Clinical Translation of Atrial Fibrillation Mechanisms'. *Nature Reviews Cardiology* 14, no. 9 (September 2017): 509–20. <https://doi.org/10.1038/nrcardio.2017.37>.

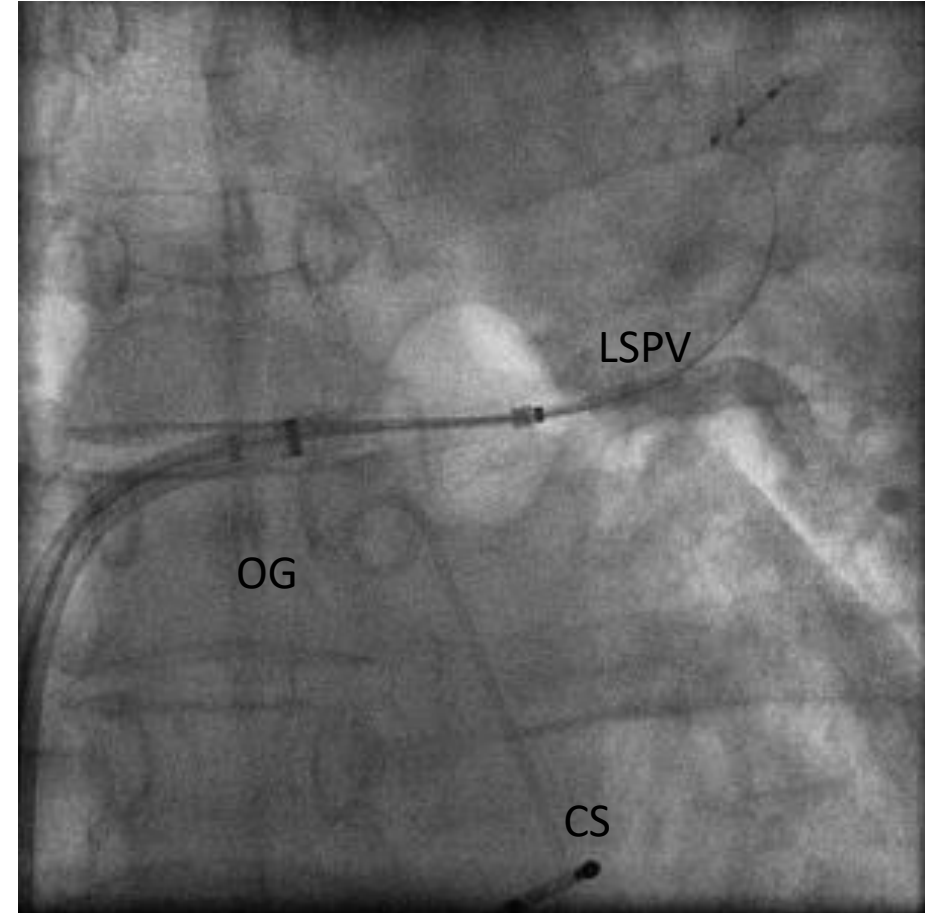
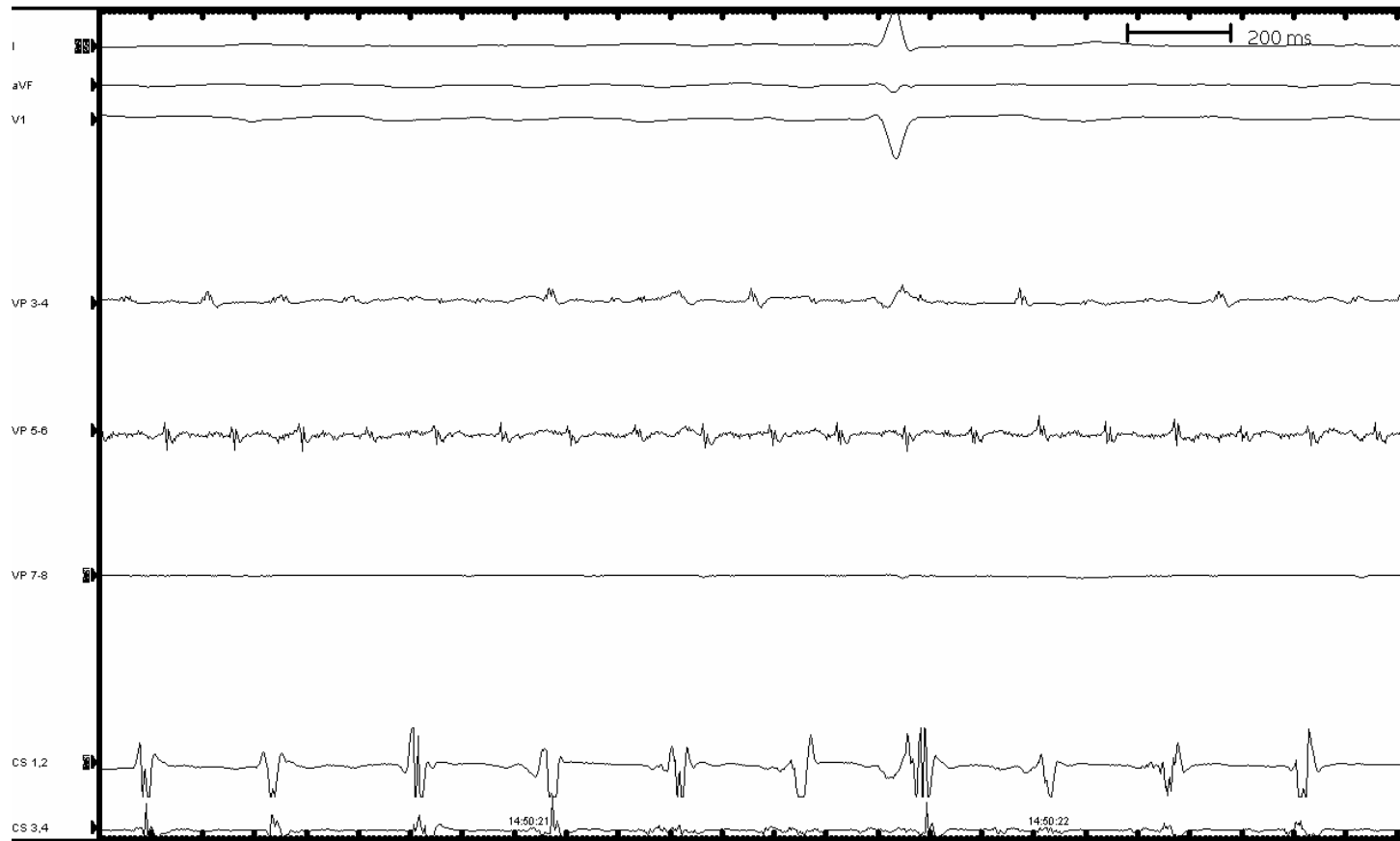


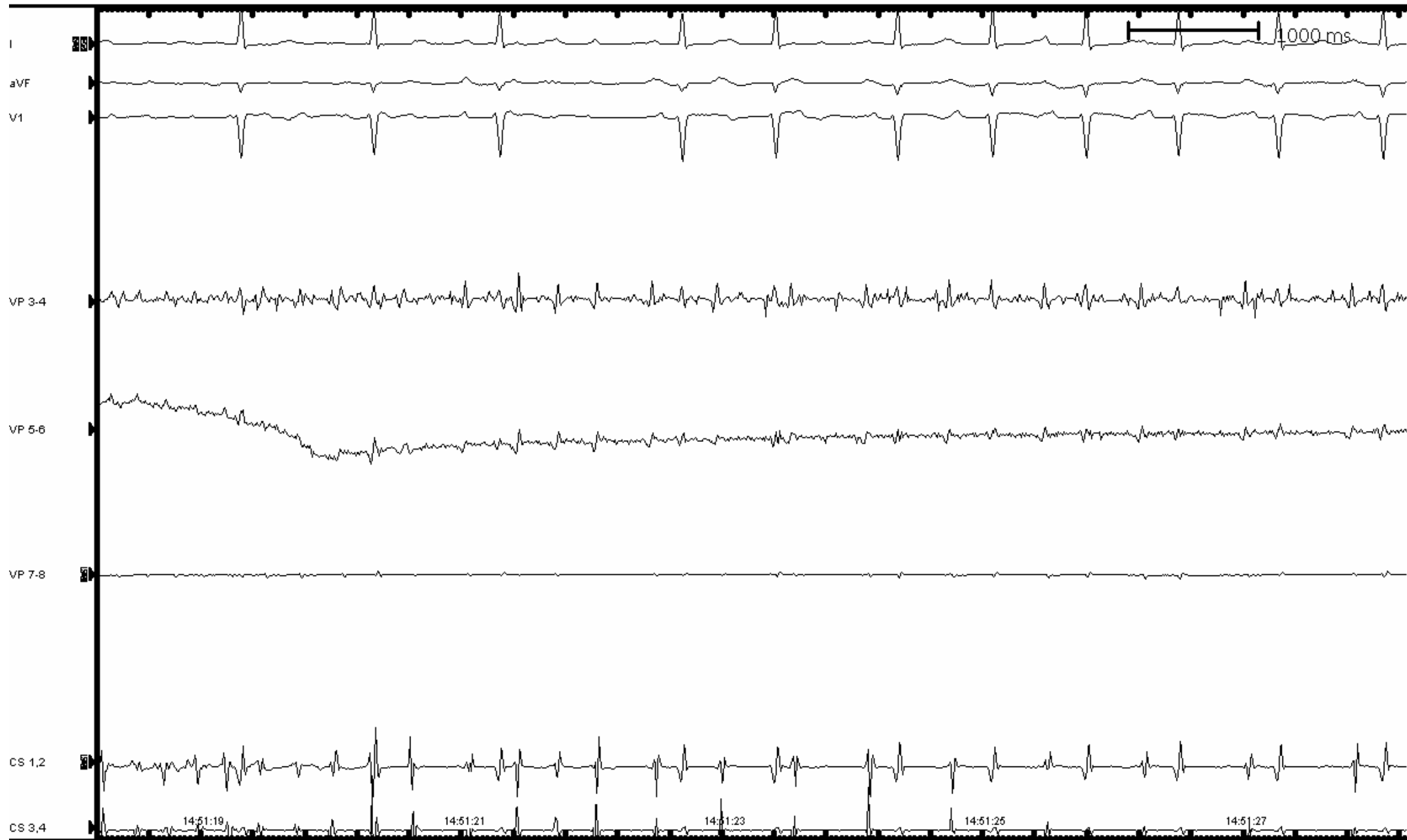
# AF – patches of Fibrosis

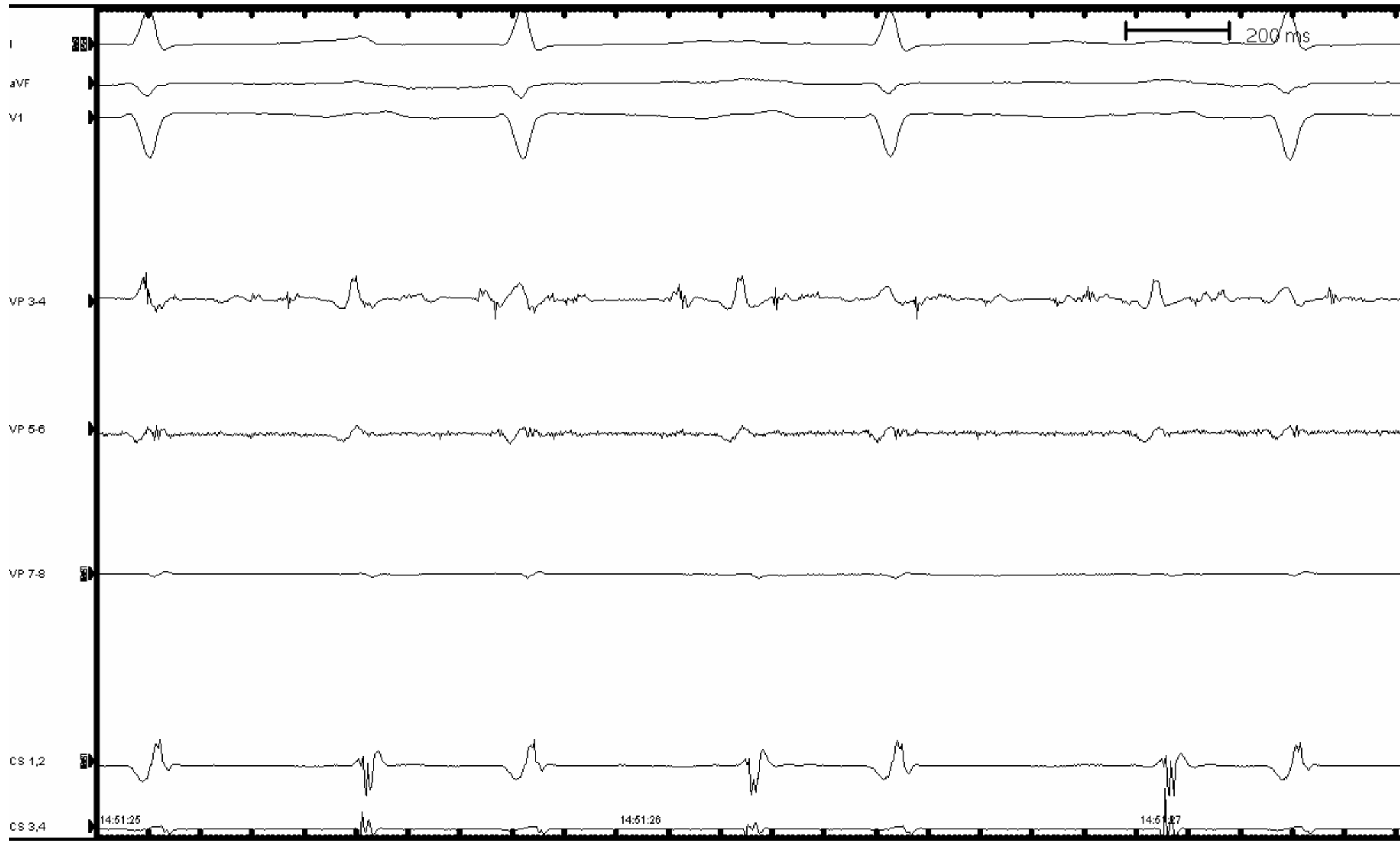
Intermittent Drivers Anchoring to Structural Heterogeneities



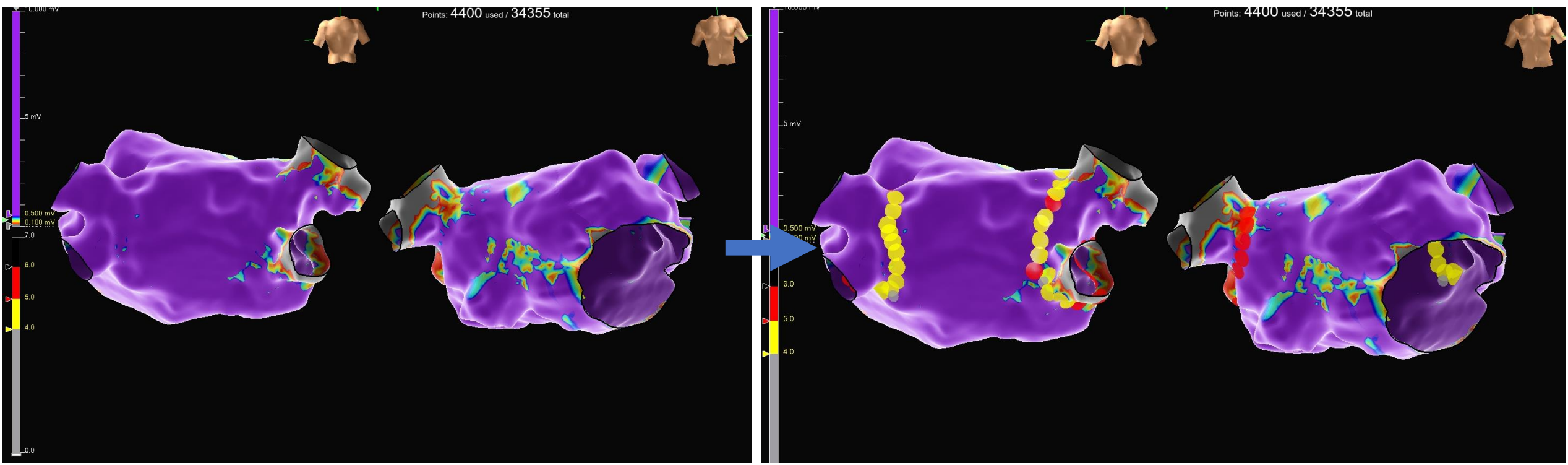
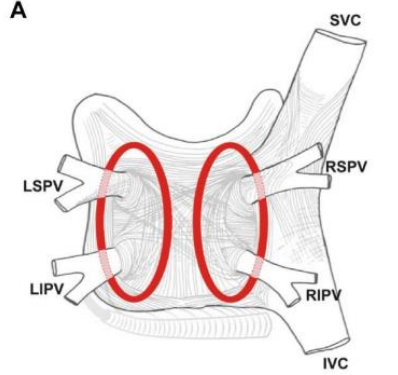
# Stratégie 1: isolation électrique des veines pulmonaires





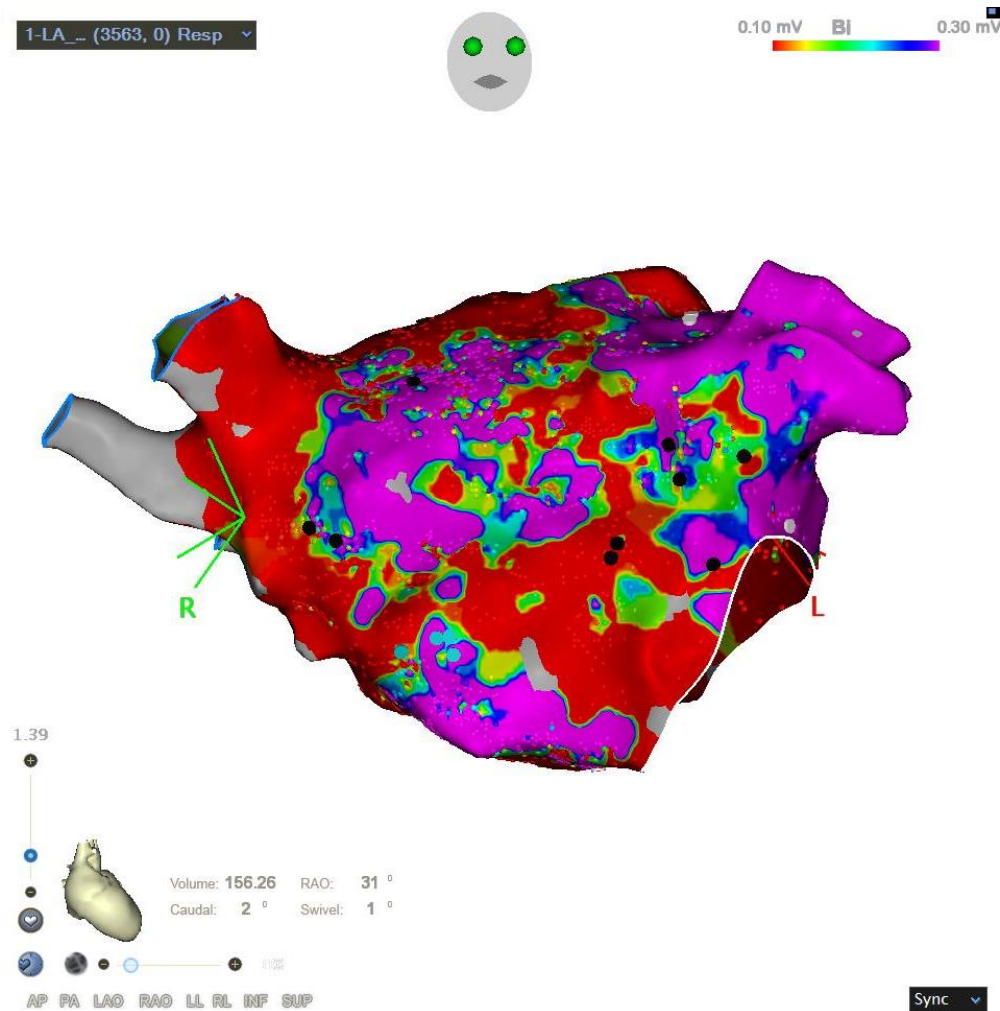


# Stratégie 2: isolation électrique des veines pulmonaires...



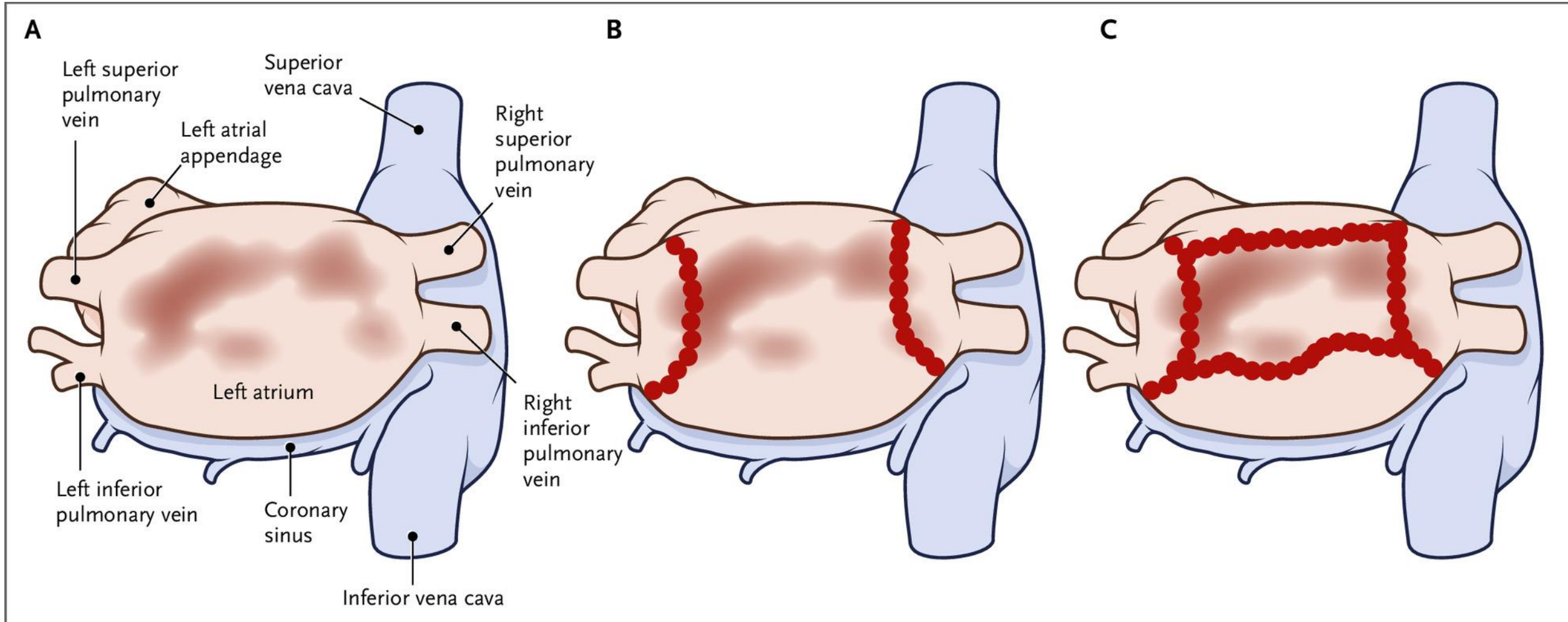
Stratégie 3: isolation électrique des veines pulmonaires...

# Stratégie 4: traitement du substrat



## Stratégie 4: traitement du substrat

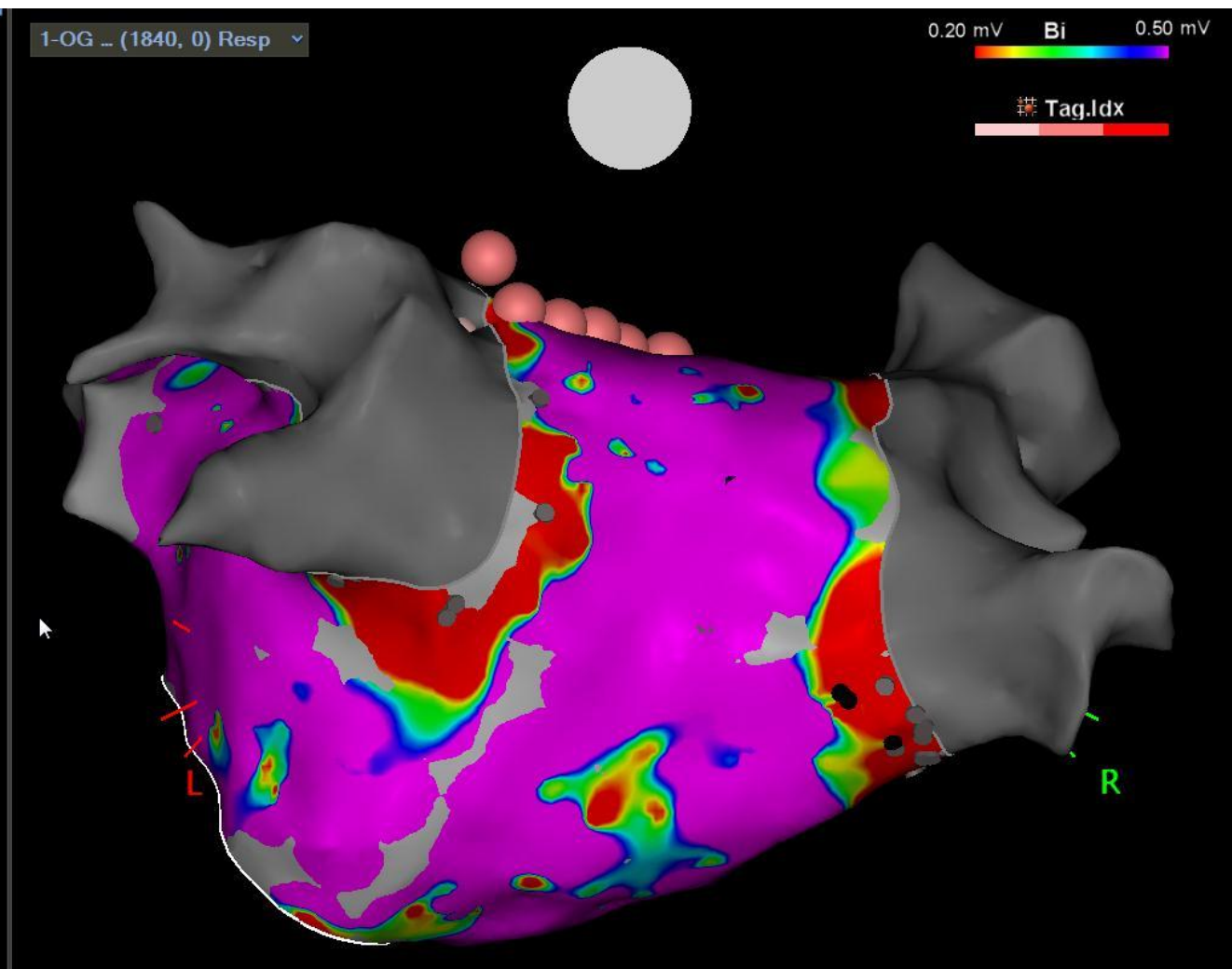
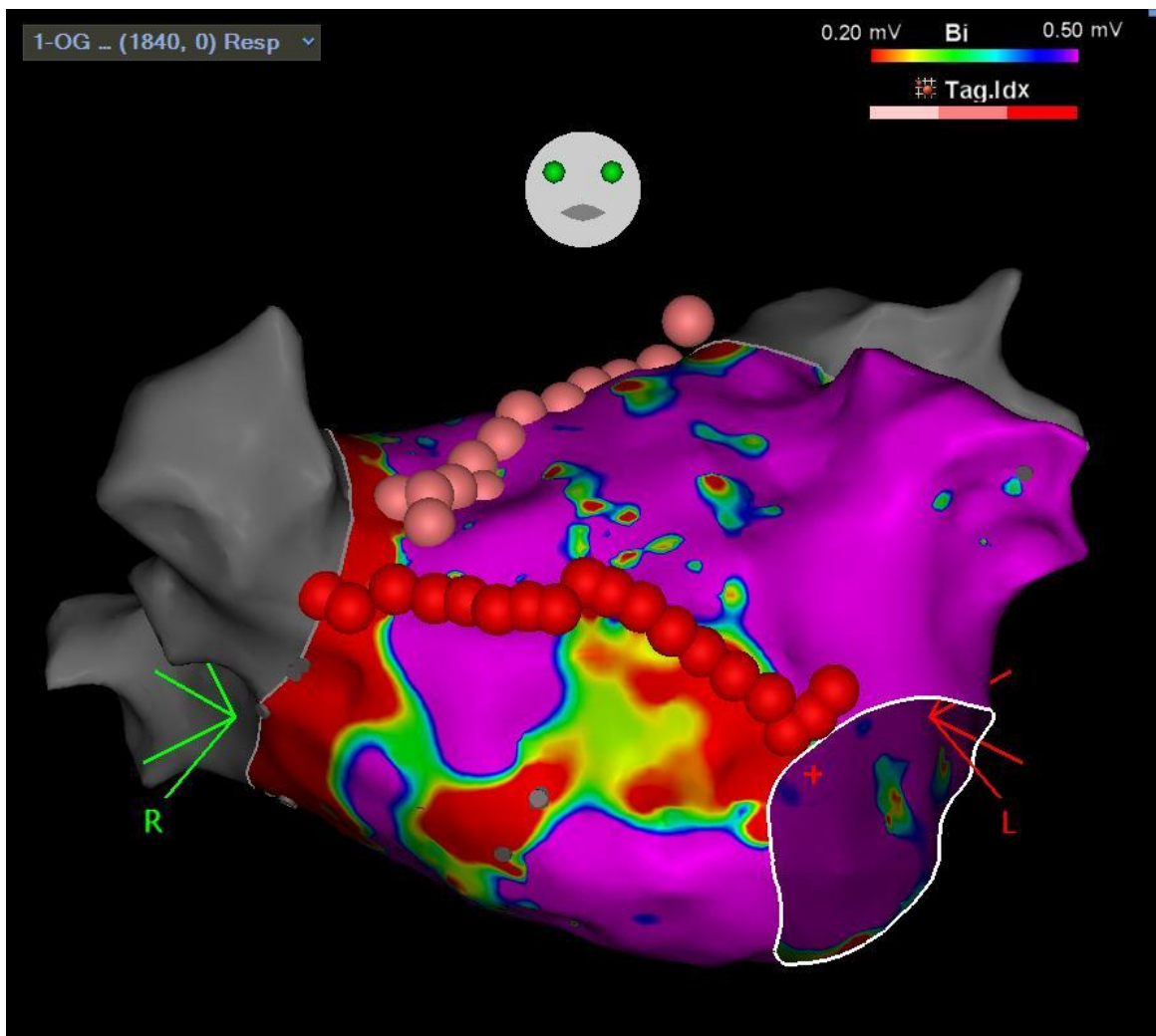
- Encerclement des zones de bas voltage





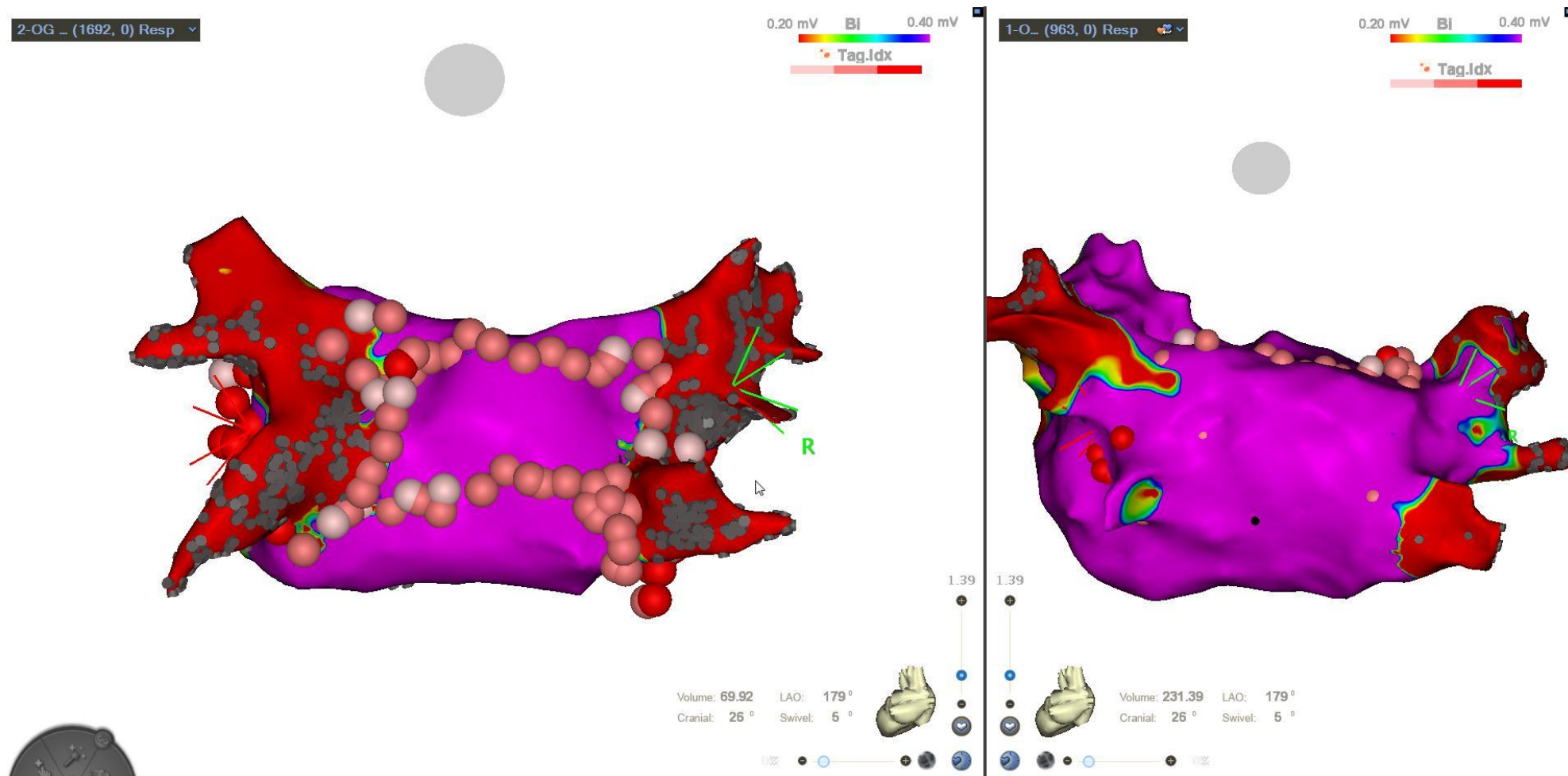
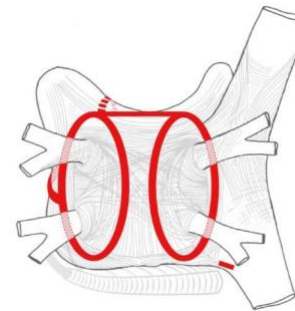
## Stratégie 4: traitement du substrat

- Encerclement des zones de bas voltage



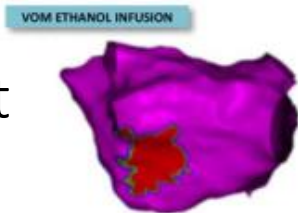
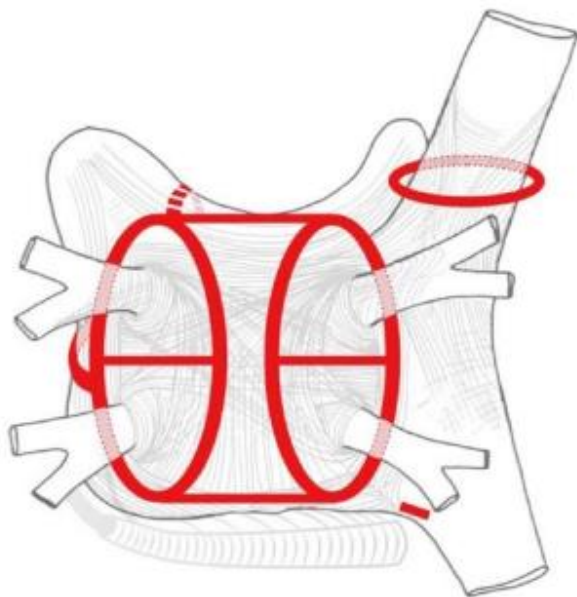
# Stratégie 4: traitement du substrat

- Segmentation de l'oreillette gauche

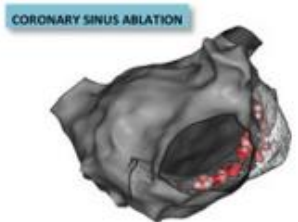
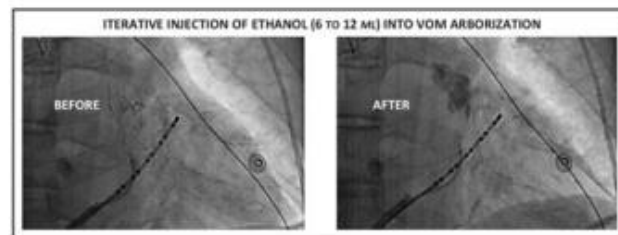


# Stratégie 4: traitement du substrat

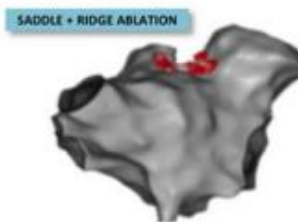
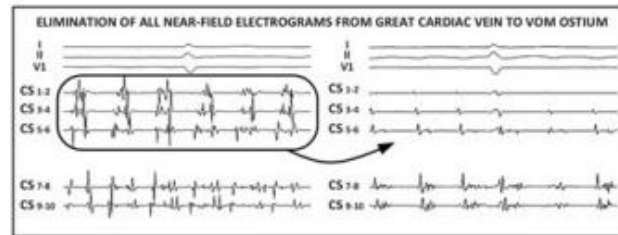
- Segmentation de l'oreillette gauche



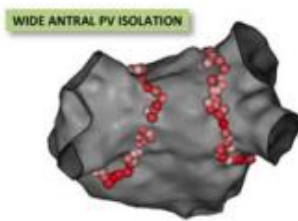
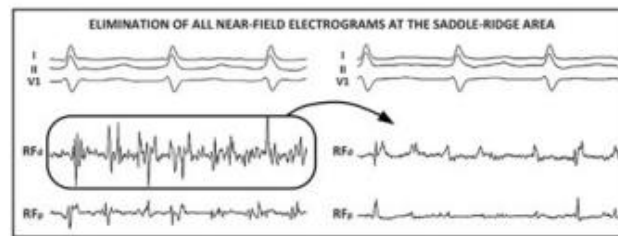
STEP 1



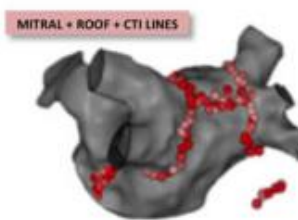
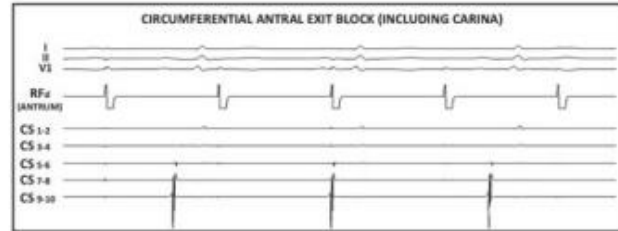
STEP 1



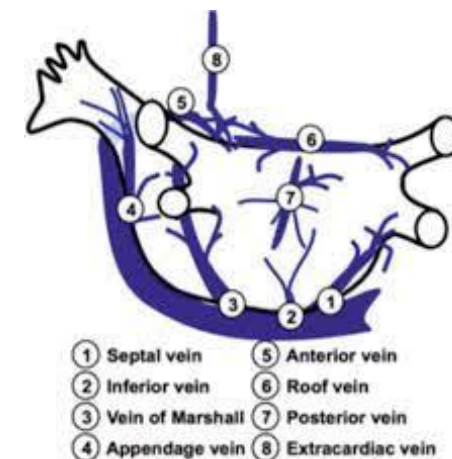
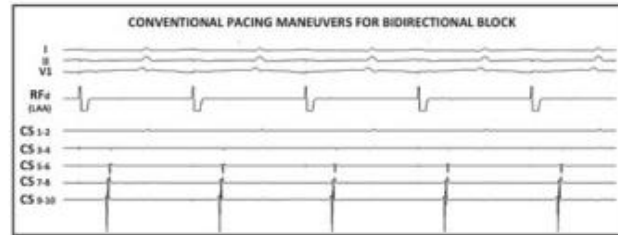
STEP 1



STEP 2

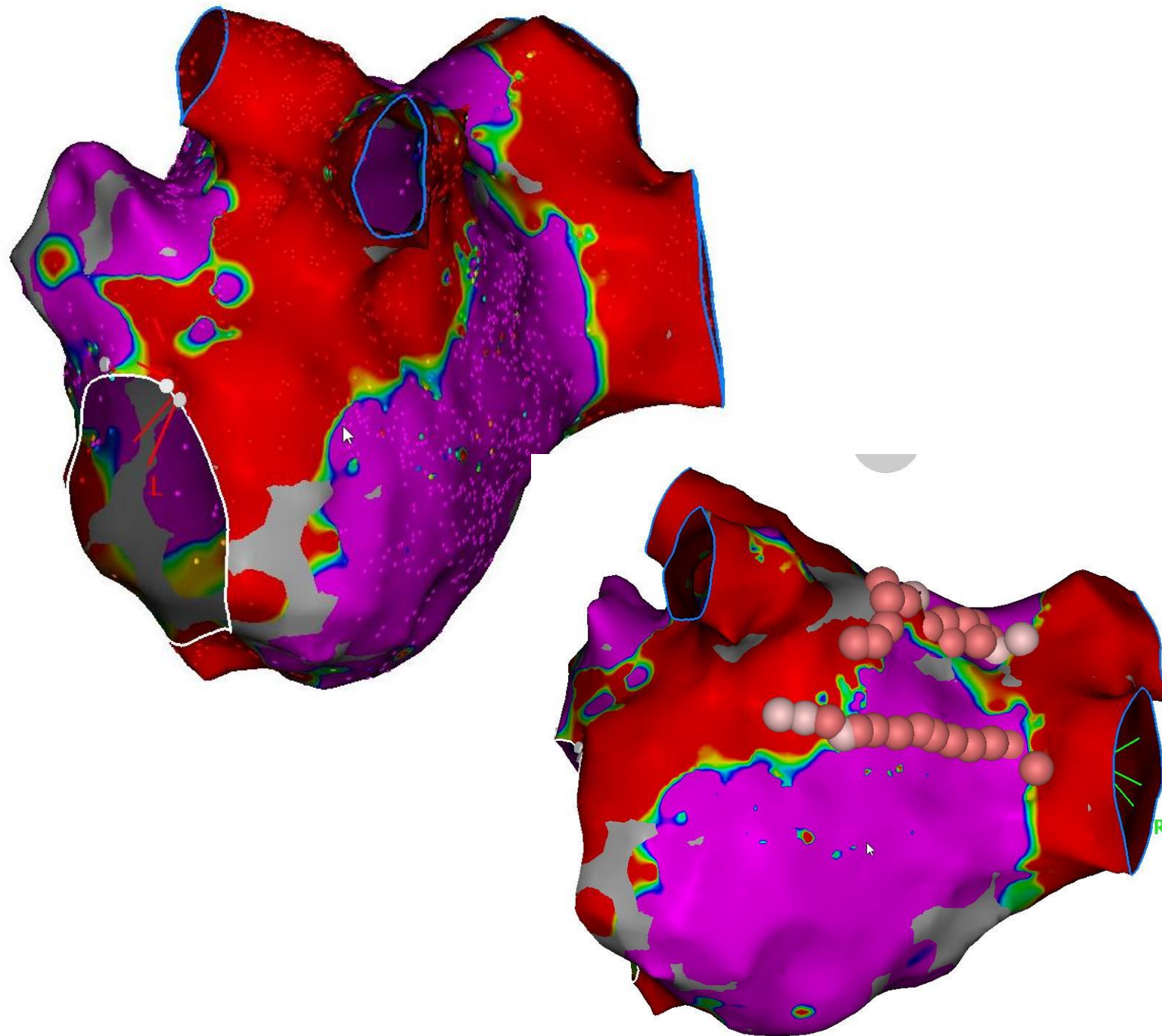


STEP 3



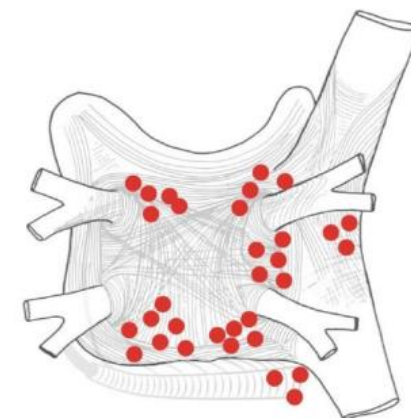
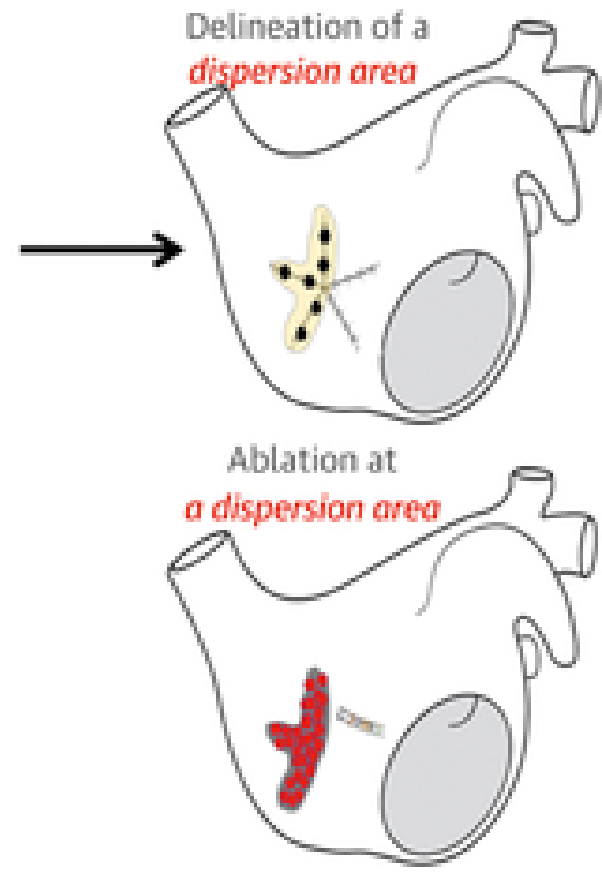
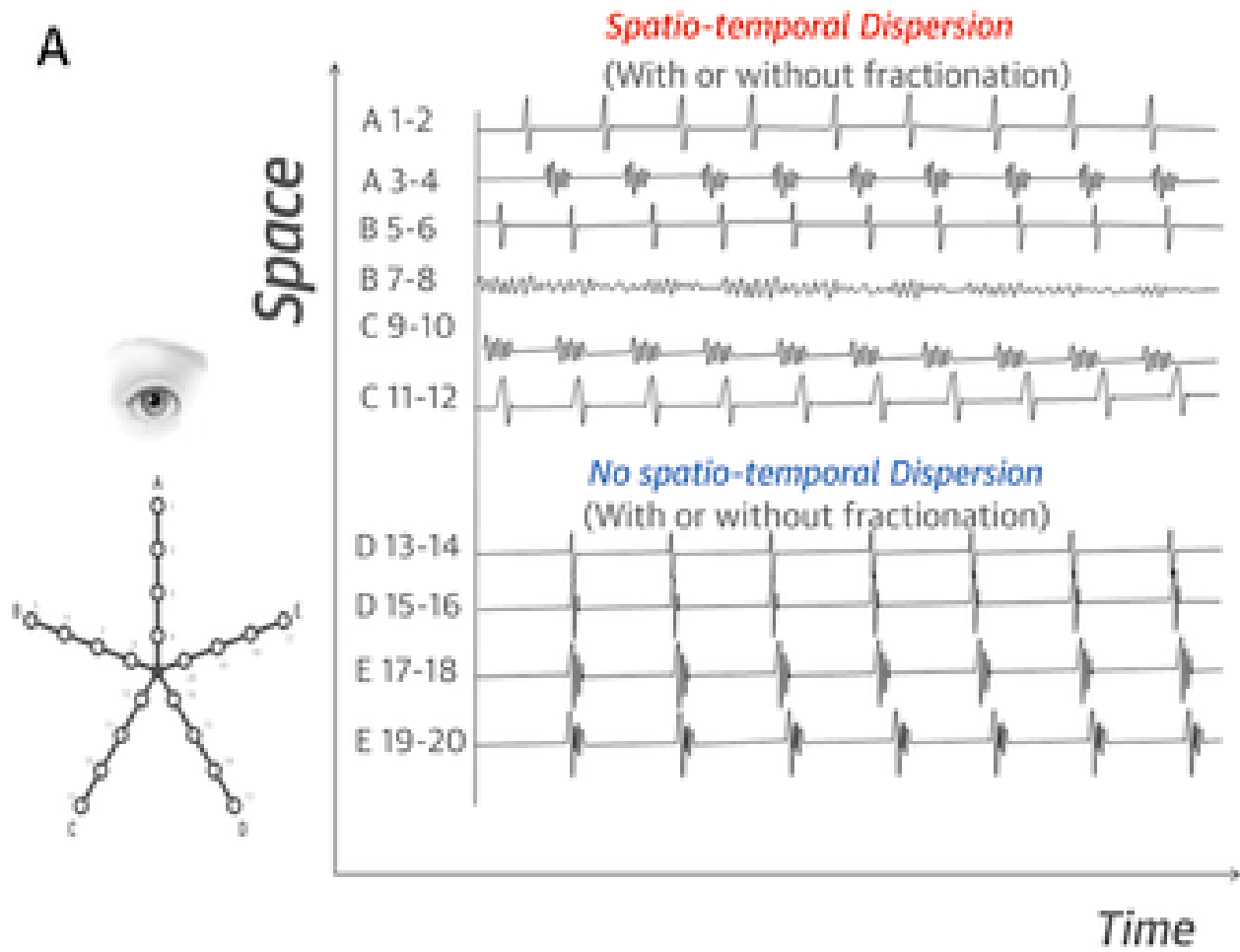
## Stratégie 4: traitement du substrat

- Segmentation de l'oreillette gauche



## Stratégie 4: traitement du substrat

- Ablation des potentiels fragmentés complexes



# Stratégies d'ablation de Fibrillation Atriale

1. Isolation électrique des veines pulmonaires (trigger et substrat)
2. Isolation électrique des veines pulmonaires (trigger et substrat)
3. Isolation électrique des veines pulmonaires (trigger et substrat)
4. Traitement du substrat (diminution masse critique, homogénéisation zones de conduction lente, ablation des rotors)
  - Encerclement des zones de bas voltage
  - Segmentation oreillette gauche
  - Identification et ablation du remodelage électrique