

2023

11^{ème}

SÉMINAIRE de ARDIOLOGIE
INTERVENTIONNELLE de TROYES

01 & 02
AVRIL



SALLE DU CONSEIL MUNICIPAL
HOTEL DE VILLE de TROYES



LA FIBRILLATION ATRIALE

L'intervention hybride

Dr Thibault VILLEMIN, Reims

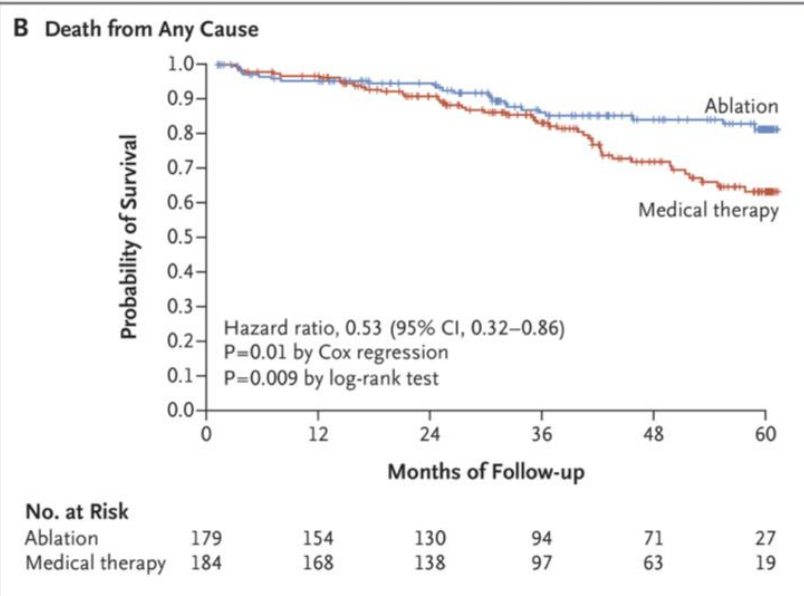
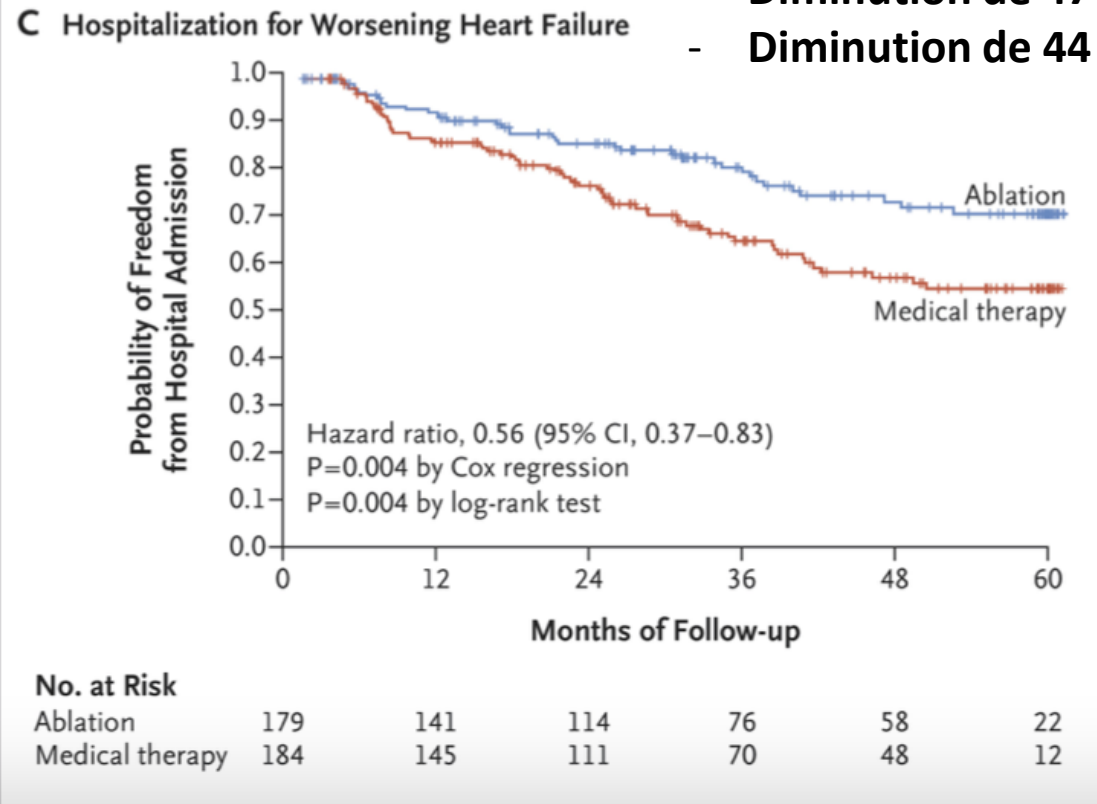
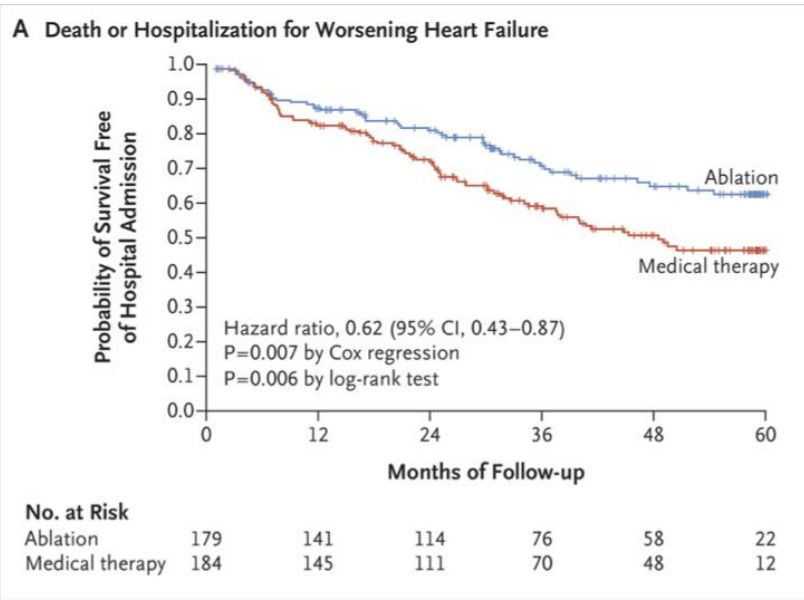
Pr Vito Giovanni RUGGIERI, Reims

Aucun conflit d'intérêt

Pourquoi le maintien du rythme sinusal est important ?

FA persistante- CASTLE AF STUDY

- 397 patients avec FE < 35%, suivi 5 ans
- Diminution de 47 % de la mortalité totale
- Diminution de 44 % des hospitalisations pour IC



Pourquoi une approche Hybride ?

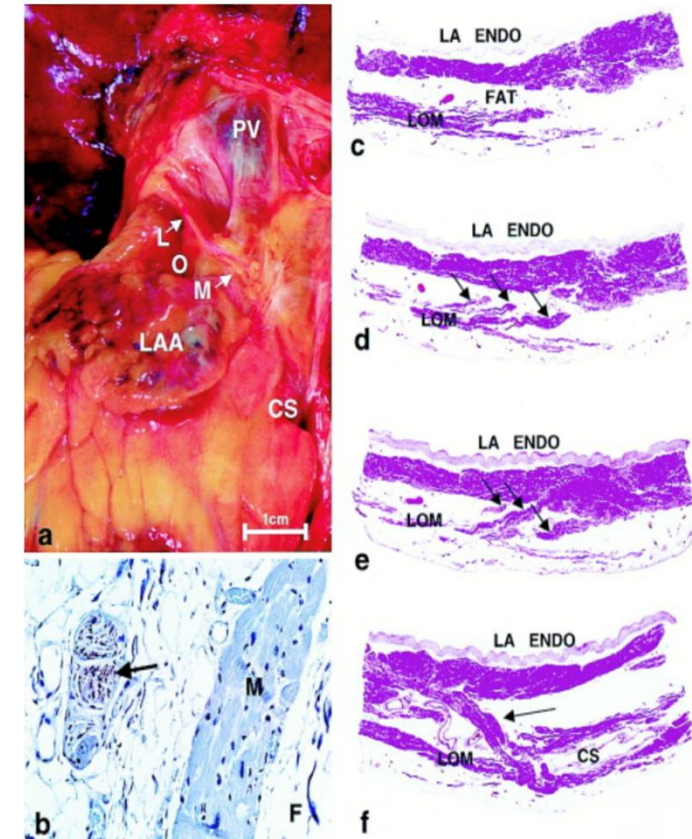
- Apporter les avantages des 2 approches :
 - Le rythmologue sait ce qu'il fait mais a parfois du mal a le faire
 - Le chirurgien a plus de facilité a le faire mais ne peut pas valider son travail

Pourquoi le rythmologue peut avoir du mal ?

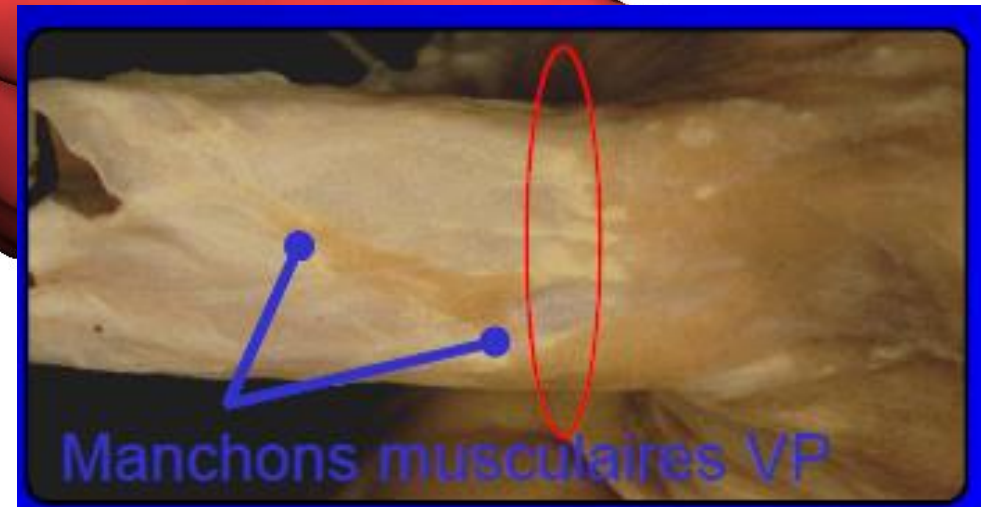
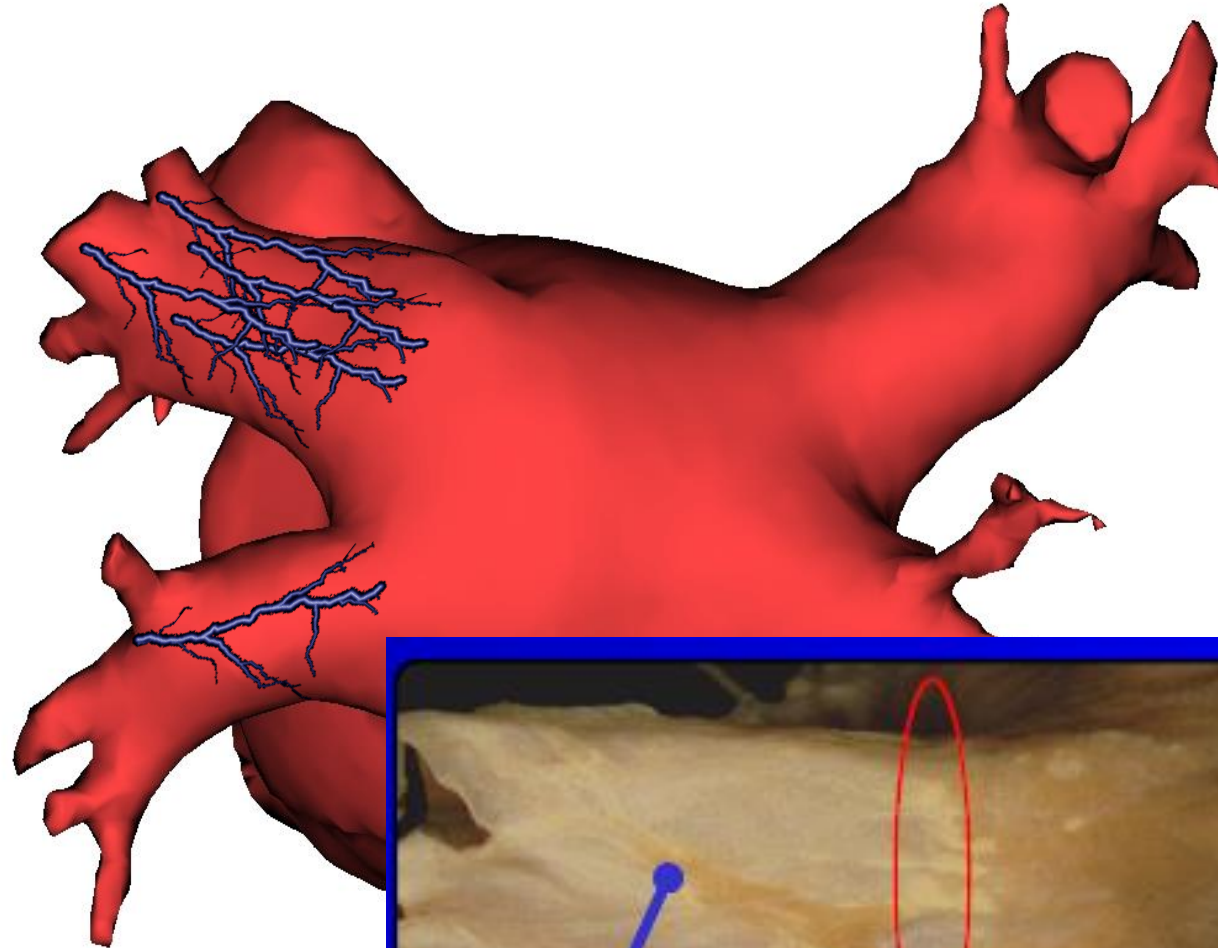
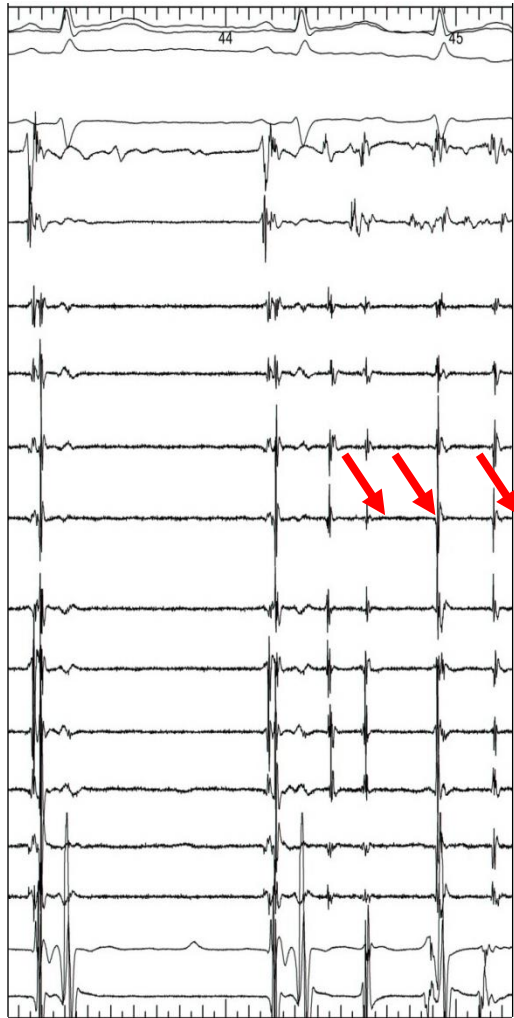
Parce qu'il ne peut pas insérer ses cathéters en sécurité



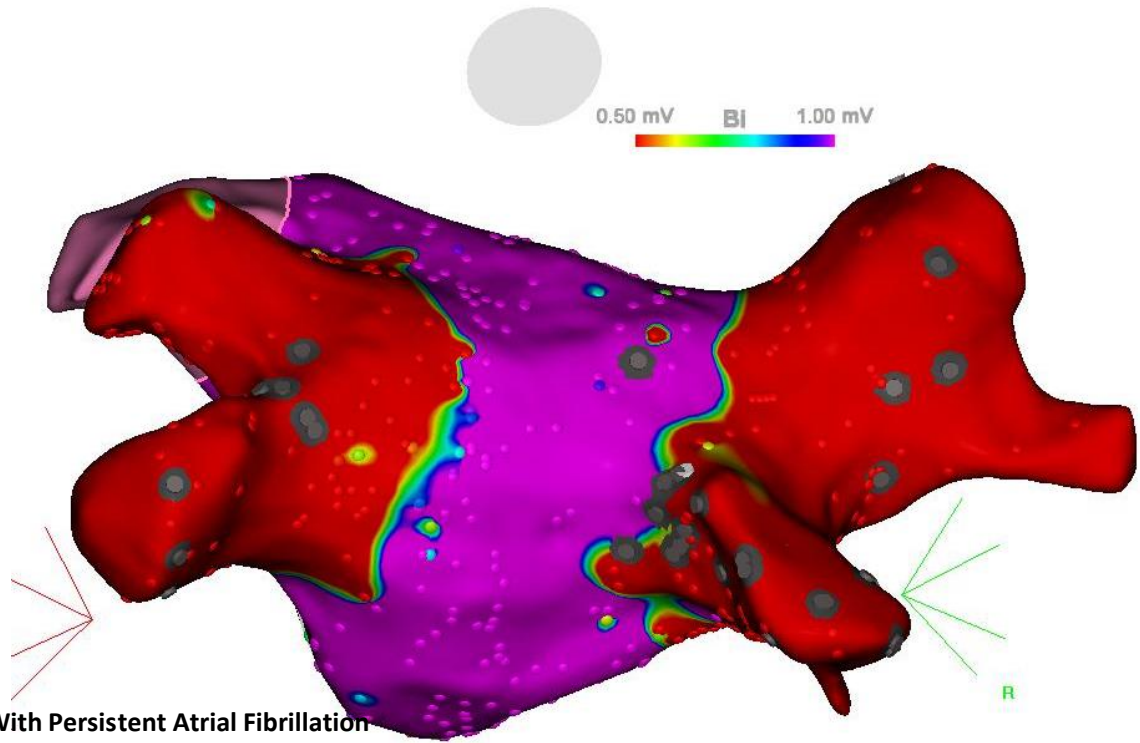
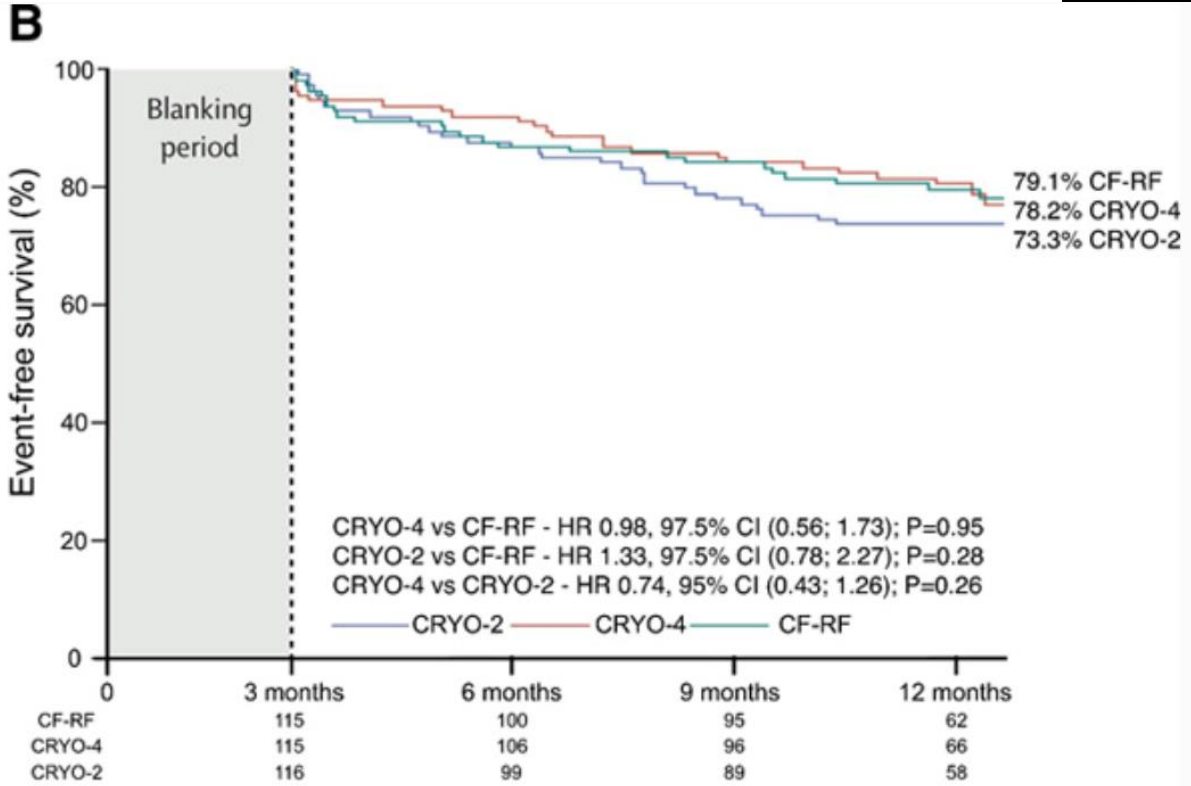
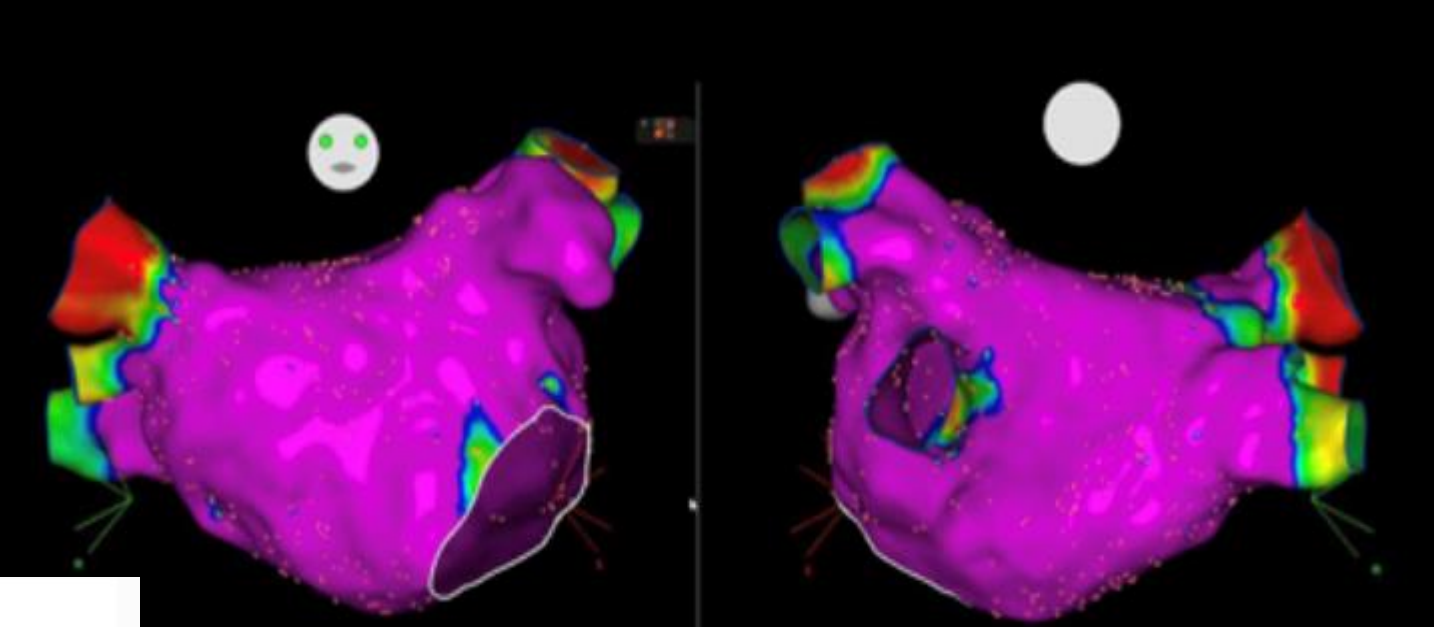
Parce qu'il n'arrive pas à créer de lésion transmurale



La FA paroxystique est déclenchée par les VPs



Le principe de base ablation de FA=isolation des VP

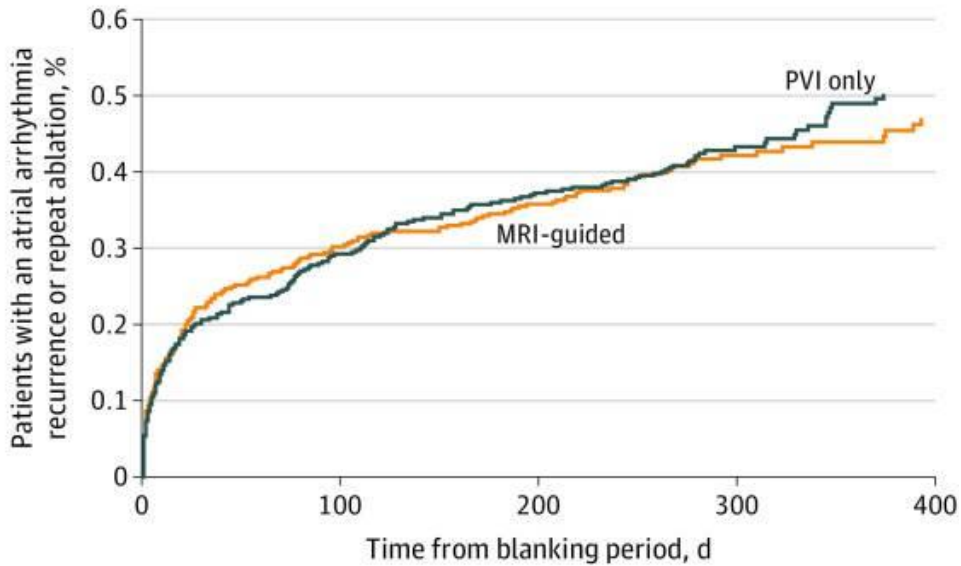
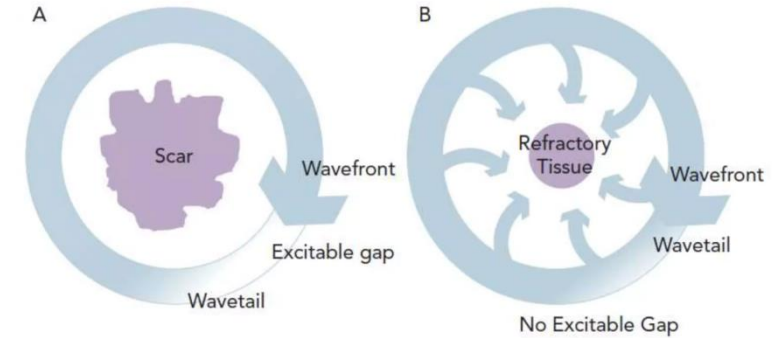


Effect of MRI-Guided Fibrosis Ablation vs Conventional Catheter Ablation on Atrial Arrhythmia Recurrence in Patients With Persistent Atrial Fibrillation
Circulation. 2019;140:1779–1788

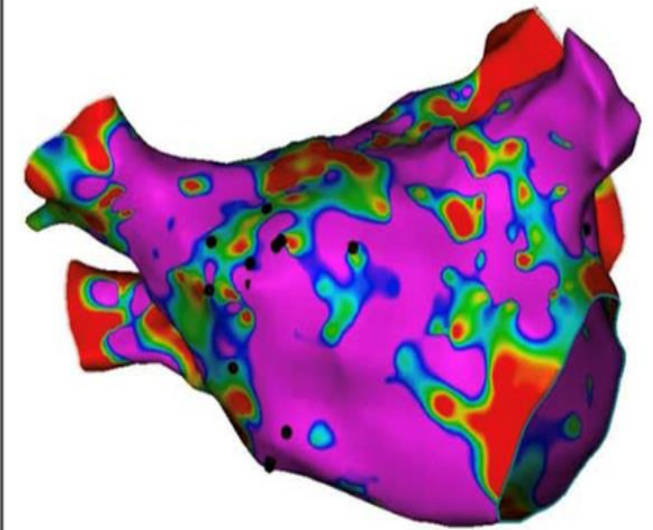
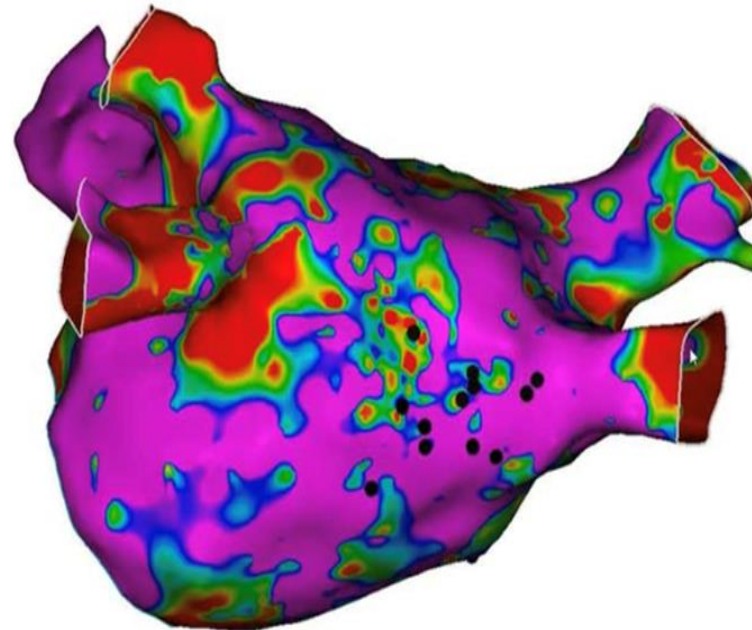
Le problème des FA trop anciennes

- La fibrose génère des ESA, des micro et macro-rentées par bloc organique et fonctionnelle
- Les défragmentations au final génèrent plus de fibrose => nouvelles arythmies +/- altération contraction atriale

Figure 1: Schematics of Anatomic and Functional Reentrant Circuits



No. at risk	0	100	200	300	400
MRI-guided	407	277	251	114	64
PVI only	408	284	249	118	69



Reconnection of roof and MI lines was observed in 9 (38%) and 13 (54%) patients during the second procedure.

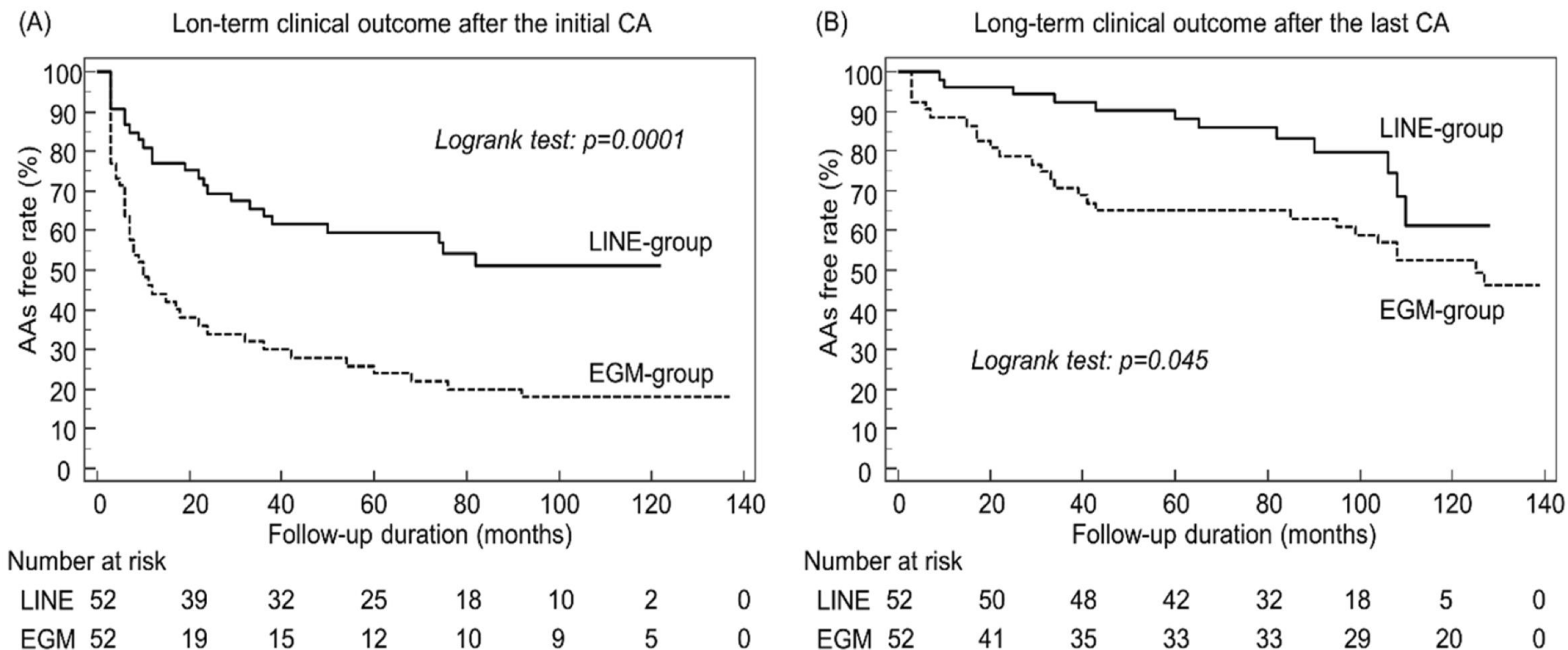
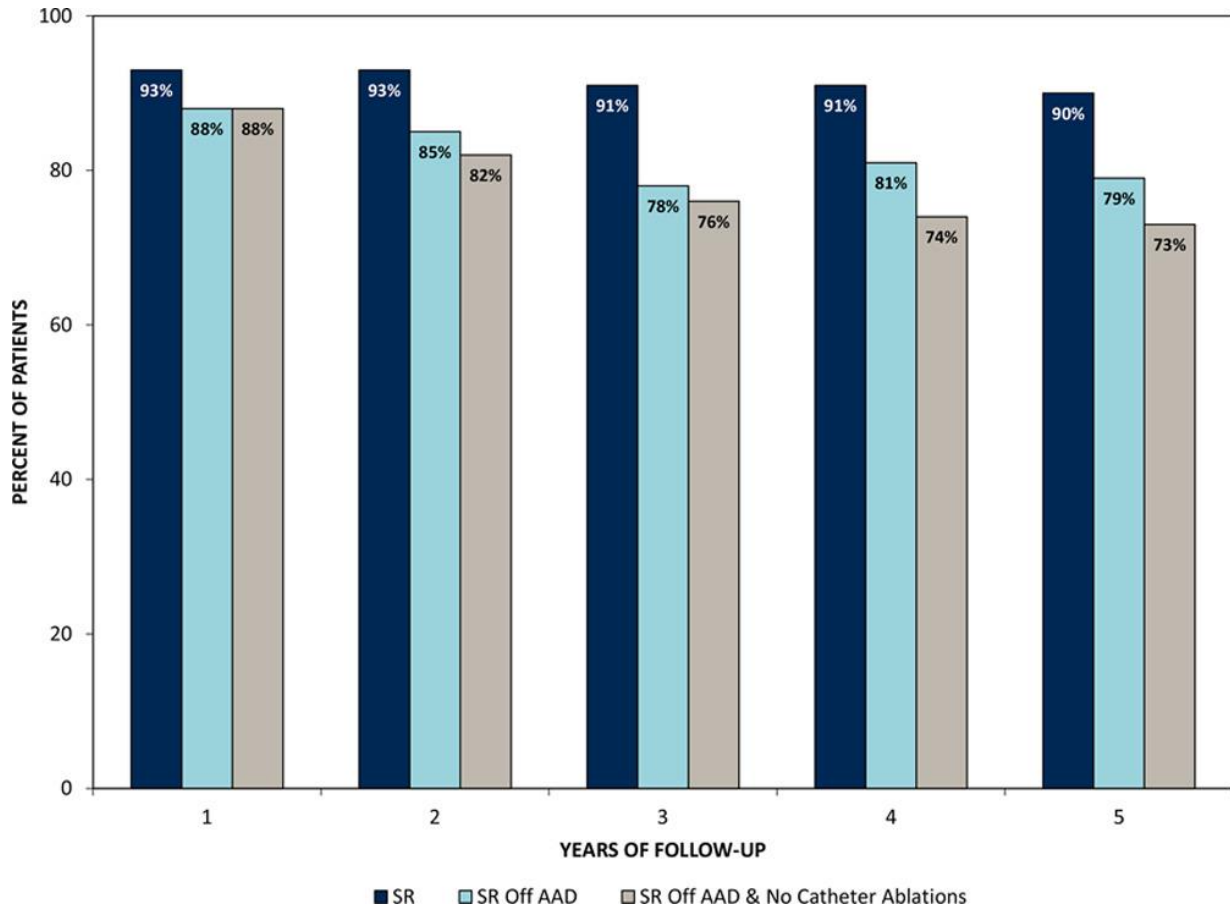


Figure 1. Kaplan–Meier curves of long-term clinical outcome after the initial (A) and last (B) CA procedure between LINE-group and EGM-group.

Résultat des lésions chirurgicales



Mais lésions obtenues par sternotomie... bref un chouia agressif

L'idée étant de pouvoir faire la même chose mais en moins invasif

Par un abord thoracoscopique

Pourquoi le chirurgien ne peut pas se passer du rythmologue

- Parce que lui non plus n'arrive pas à créer toujours de lésions transmurales
- Parce qu'il ne peut pas vérifier ses lignes d'ablations
- Parce qu'il n'a pas accès à toutes les zones (ICT et ligne mitrale notamment) s'il ne veut pas être trop invasif

Un peu de chirurgie...

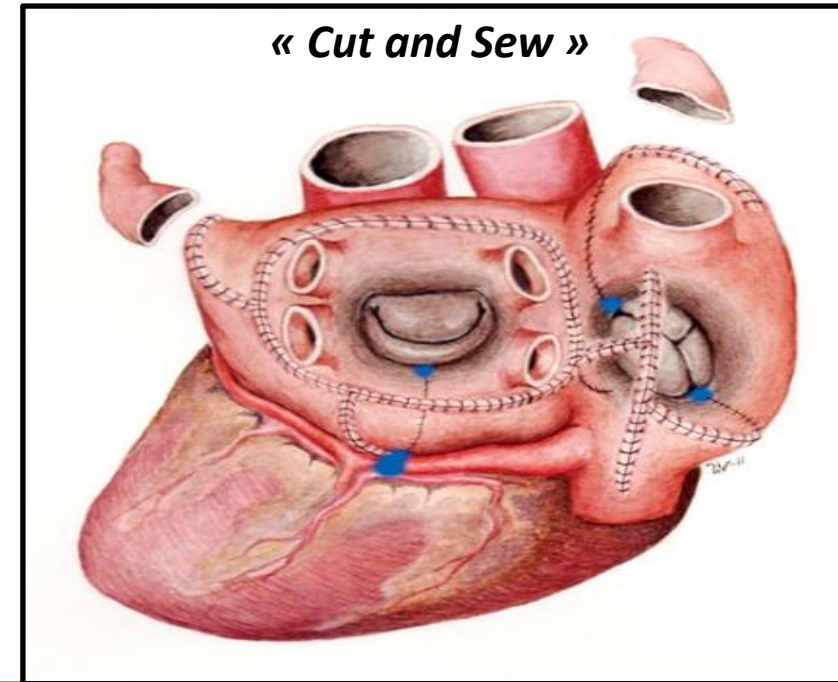
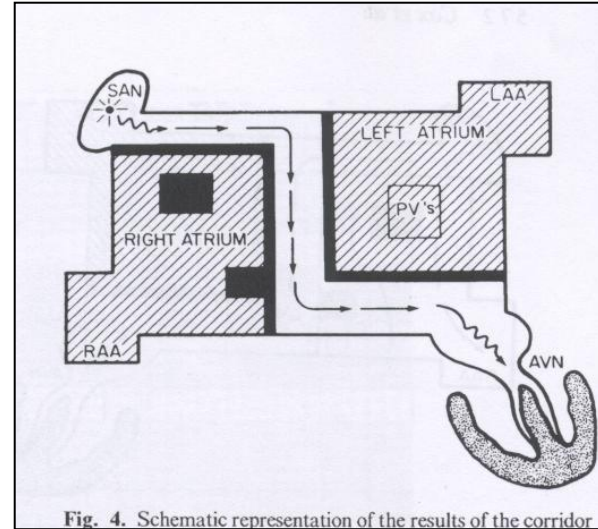


L'histoire



- 1975 : Ablation du nœud
- 1985 : corridor
- 1980-90 : Cox /études
- Cox Maze III

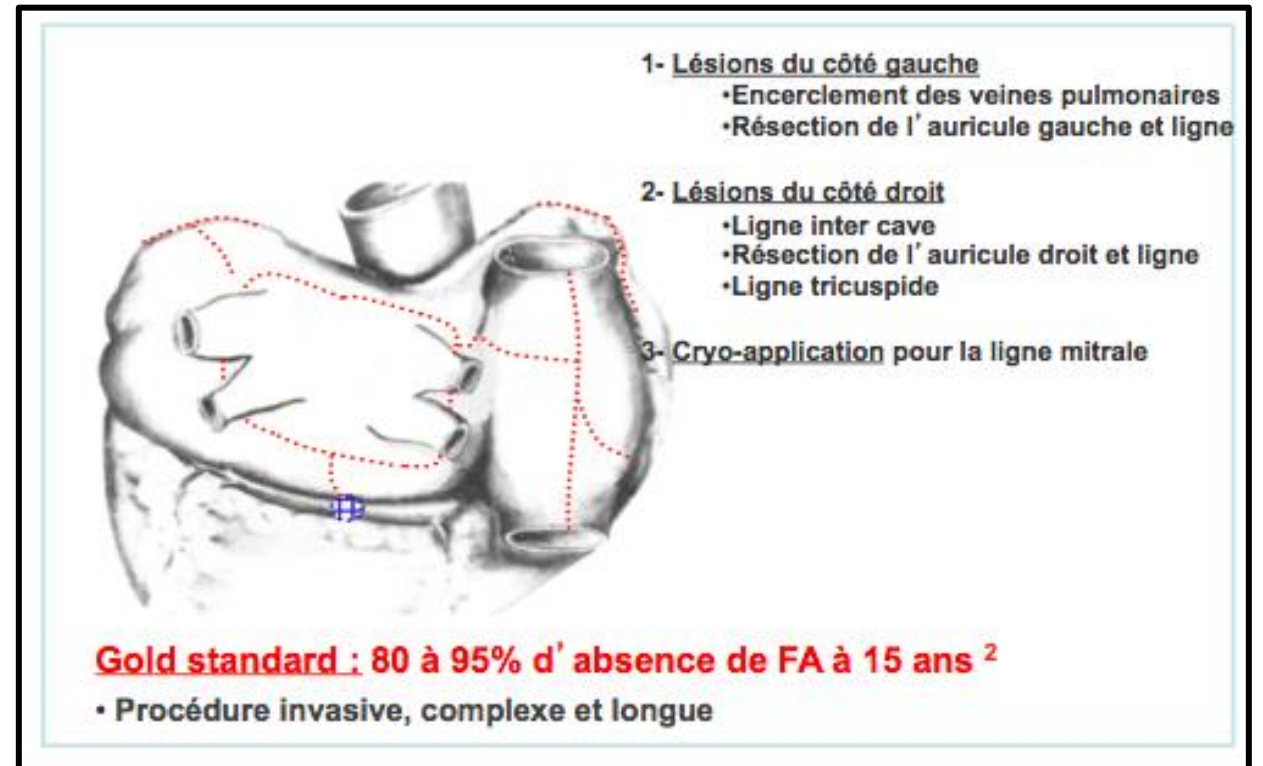
Technique du Corridor (Guiraudon)



Interrompre les circuits de réentrée - Imposer un trajet à l'onde de dépolarisation

Gold Standard

- 1975 : Ablation du nœud
- 1985 : corridor
- 1980-90 : Cox /études
- Cox Maze III



Interrompre les circuits de réentrée - Imposer un trajet à l'onde de dépolarisation

- 1975 : Ablation du nœud
- 1985 : co
- 1980-90 : Cox /études
- Cox Maze III

Lésions transmurales et continues



1- Lésions du côté gauche

- Encerclement des veines pulmonaires
- Résection de l'auricule gauche et ligne

2- Lésions du côté droit

- Ligne inter cave
- Résection de l'auricule droit et ligne
- Résection sur la ligne mitrale

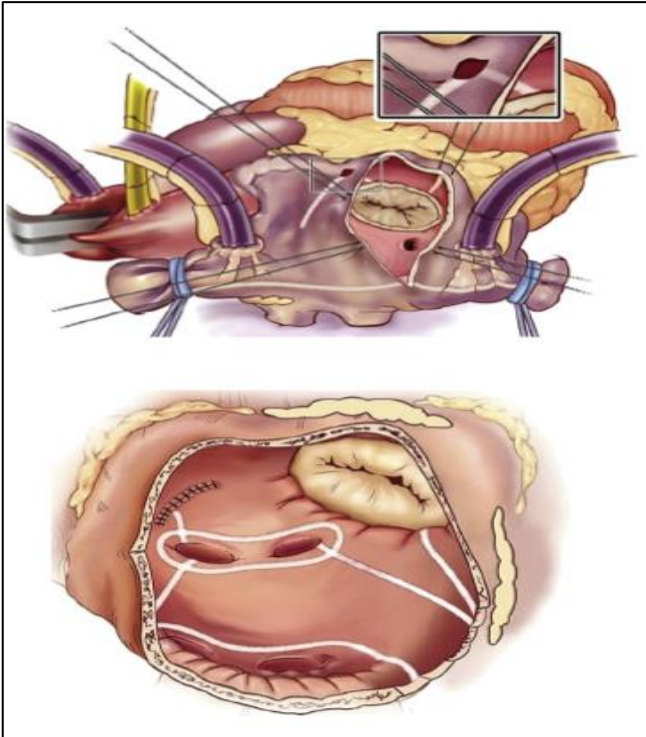
Gold standard : 80 à 95% d'absence de FA à 15 ans ²

- Procédure invasive, complexe et longue

Interrompre les circuits de réentrée - Imposer un trajet à l'onde de dépolarisation

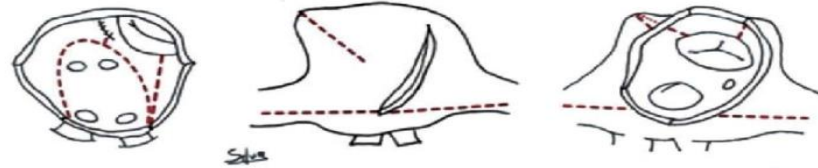
Cox Maze IV sous CEC (FA concomitante)

Cox-Maze IV



Damiano et al. JTCS 2011;141:113-121

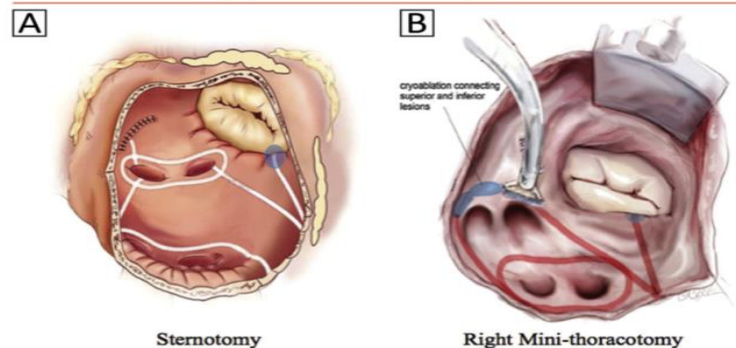
Surgical lesion sets for the biatrial Cox maze procedure for concomitant AF surgery.



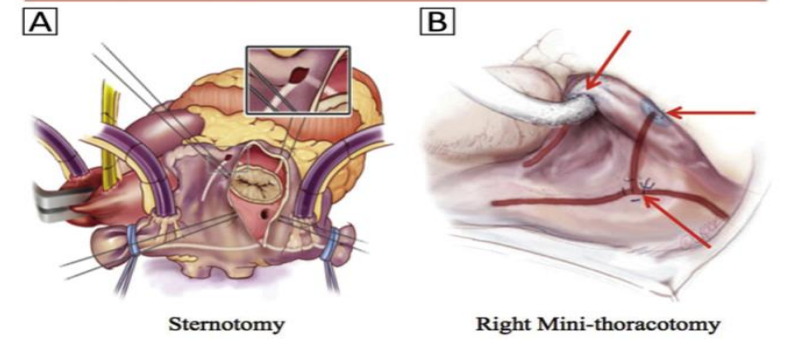
Surgeon's view showing left atrial lesions (left panel) and right atrial lesions (middle and right panel)

2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

Left Atrial Lesion Set



Right Atrial Lesion Set



The Society of Thoracic Surgeons 2017 Clinical Practice Guidelines for the Surgical Treatment of Atrial Fibrillation

Quels dispositifs ?

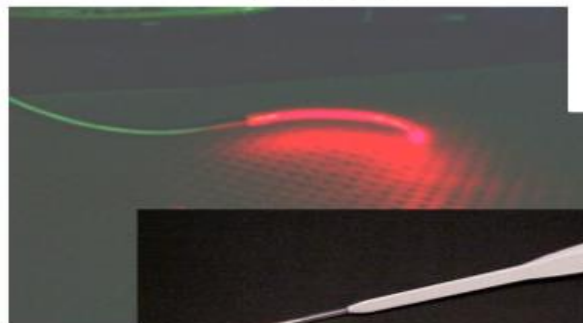
Bipolar Radiofrequency



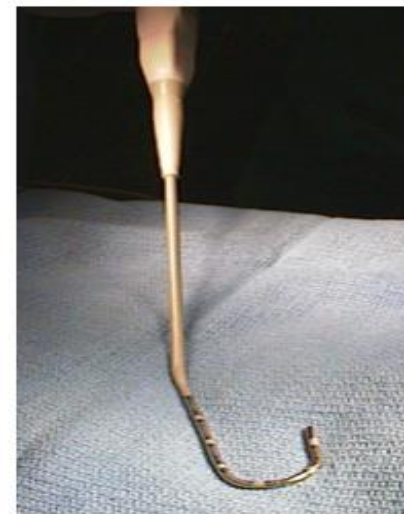
Microwave



Laser



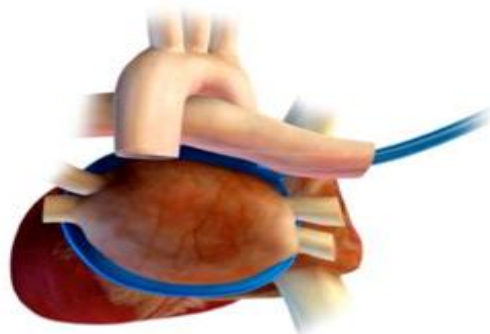
Unipolar Radiofrequency



Cryoablation



High frequency ultrasound



Quels dispositifs ?

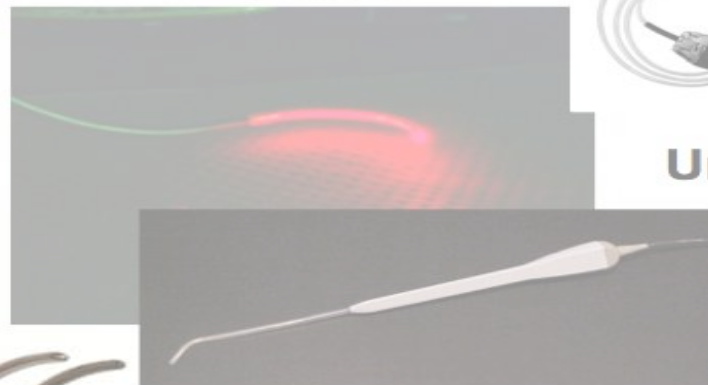
Bipolar Radiofrequency



Microwave



Laser



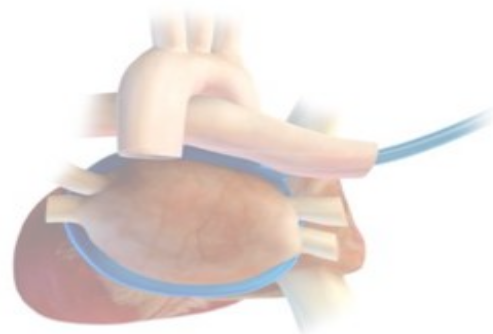
Unipolar Radiofrequency



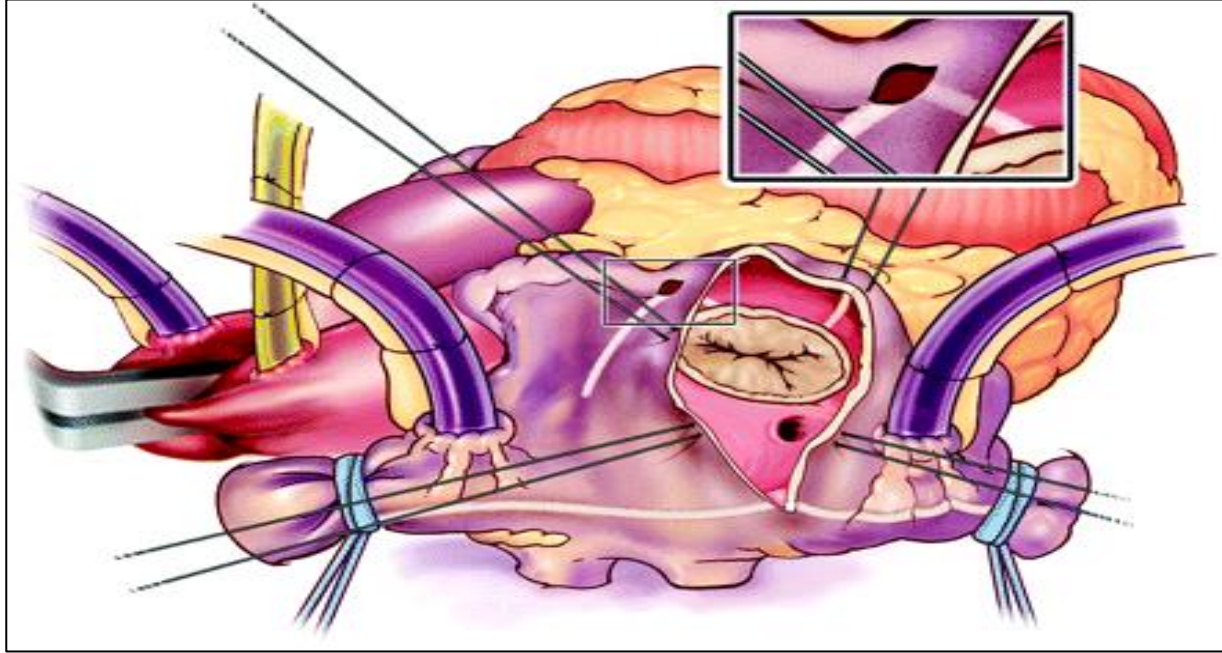
Cryoablation



High frequency ultrasound

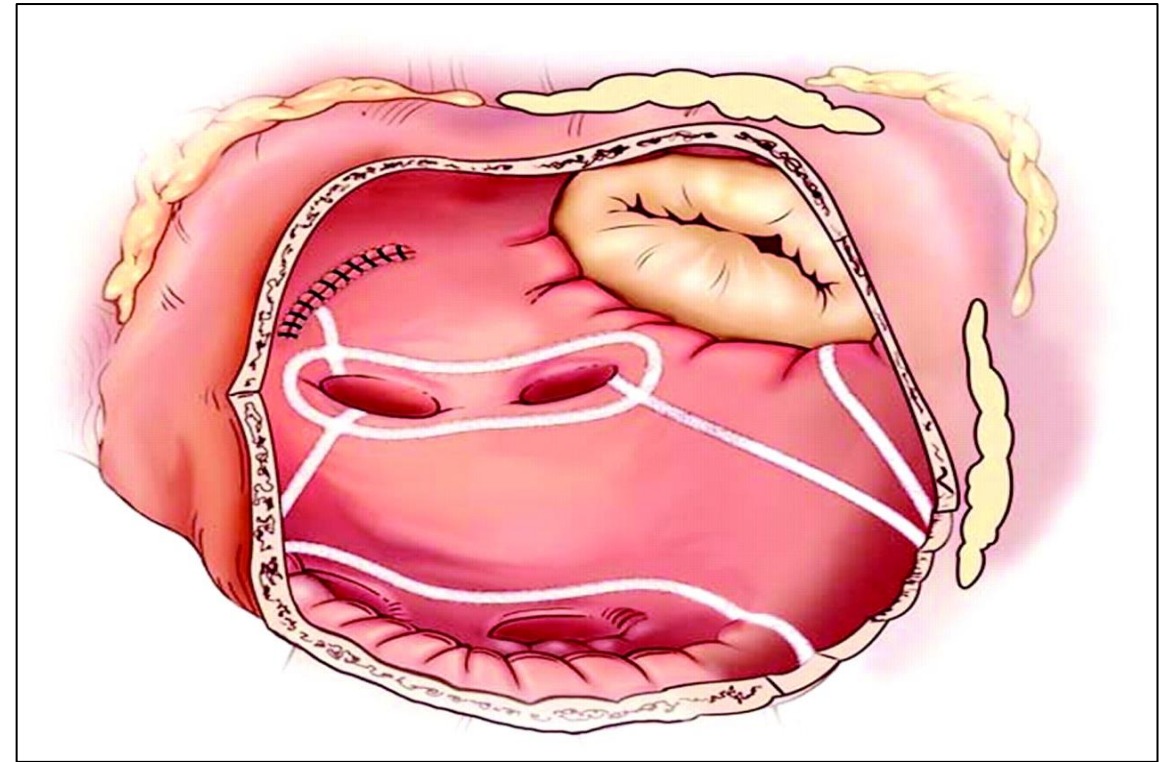


Quels résultats ?



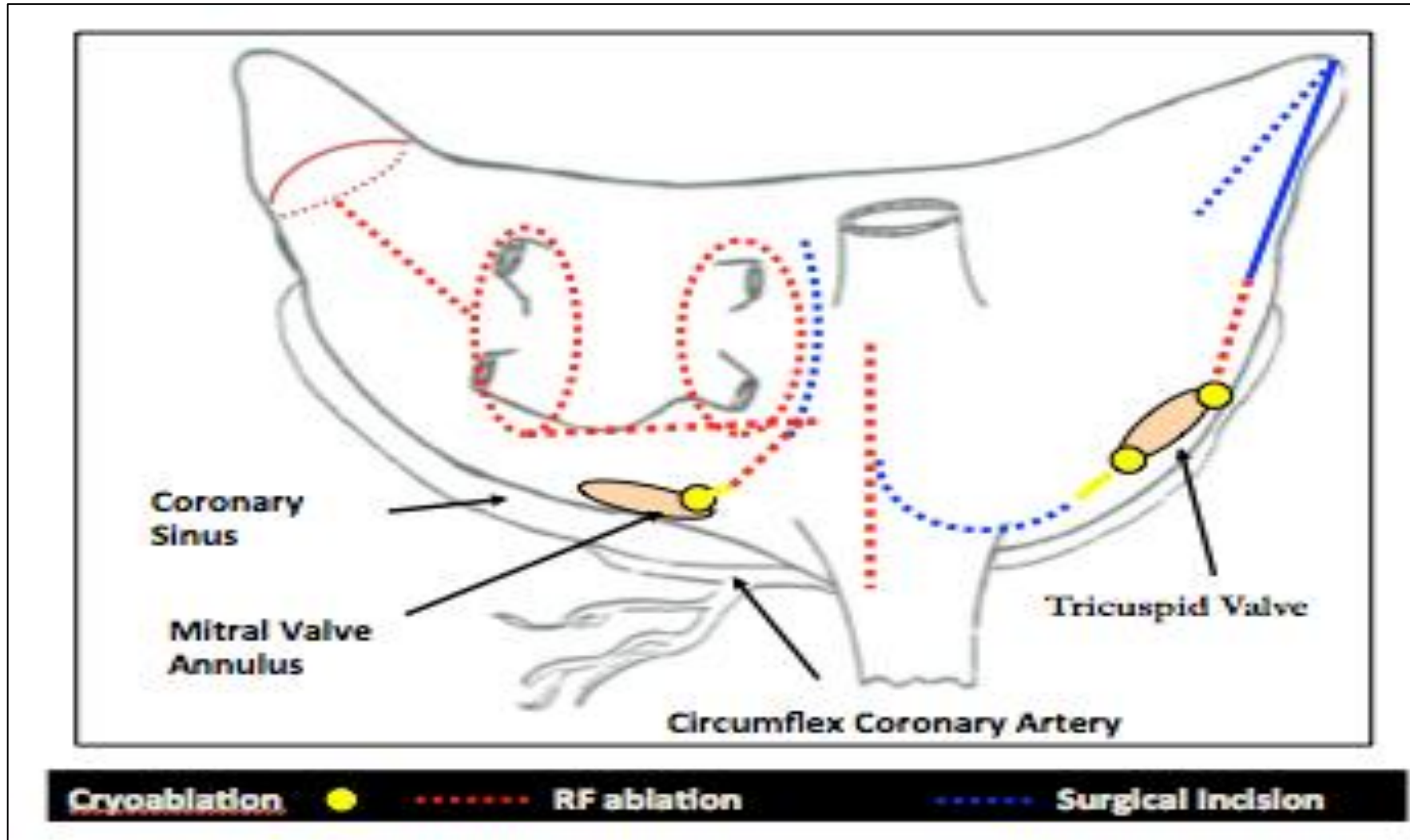
90% sans récurrence à 2 ans
Dont 84 % sans antiarythmiques

- Cox Maze IV



Weimar T. Circ Arrhythm Electrophysiol. 2012 Feb;5(1):8-14

Quels dispositifs ?



Quels résultats ?

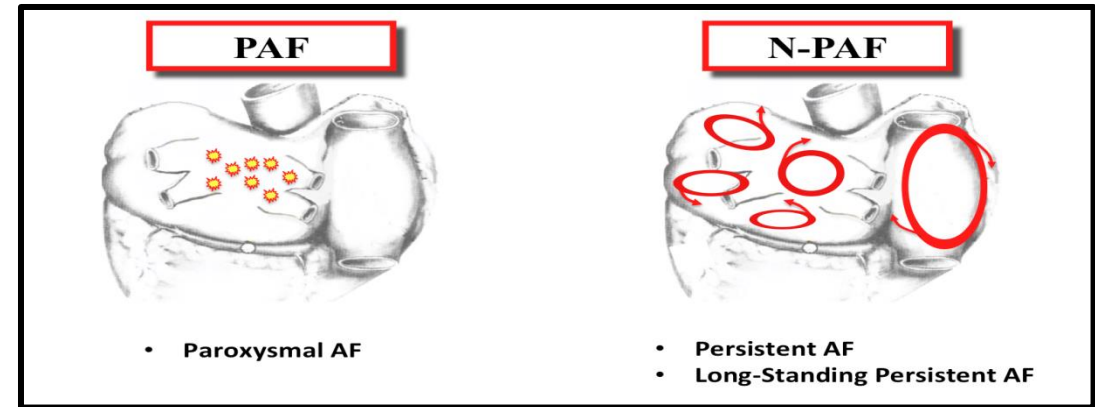
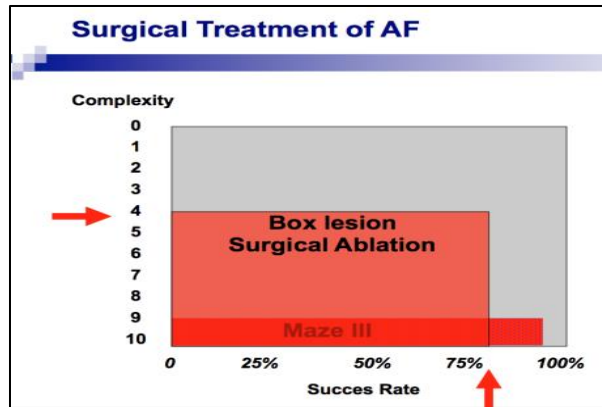
(Figure 18).⁷⁸³ Thereby, the Cox maze procedure creates an electrical labyrinth (maze) of passages through which the sinoatrial node impulse finds a route to the atrioventricular node while preventing fibrillatory conduction. The Cox maze procedure and other, often simpler, forms of AF surgery have mainly been used in patients undergoing other open heart surgical procedures.^{461,466,784–798} In a systematic review commissioned for these guidelines, performing concomitant AF surgery resulted in increased freedom from AF, atrial flutter, and atrial tachycardia compared to no concomitant AF surgery (RR 1.94; 95% CI 1.51–2.49; $n = 554$ from seven RCTs) (Web Figure 3).¹⁰⁴⁰ Patients undergoing the Cox maze procedure required pacemaker implantation more often (RR 1.69; 95% CI 1.12–2.54; $n = 1631$ from 17 RCTs), without a detectable difference in other outcomes or complications. These findings are underpinned by an analysis of the Society of Thoracic Surgeons database comprising 67 389 patients in AF undergoing open heart surgery: mortality or major morbidity was not affected by concomitant AF surgery (adjusted OR 1.00; 95% CI 0.83–1.20), but pacemaker implantation was more frequent (adjusted OR 1.26; 95% CI 1.07–1.49).⁷⁹⁹ Predictors of AF recurrence after surgery include left atrial dilatation, older age, >10-year history of AF, and non-paroxysmal AF.^{800–804} Regarding AF type, surgical PVI seems effective in paroxysmal AF.⁸⁰⁵ Batrial lesion patterns may be more effective in persistent and long-standing persistent AF.^{797,803,806} The suggested management of patients with AF-related symptoms undergoing cardiac surgery is displayed in Figure 19, with an important contribution of the AF Heart Team to advise and inform patient choice.

2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

- Efficace
- Pas d'augmentation
de la morbi- mortalité opératoire
- À l'exception de plus de Pace Makers

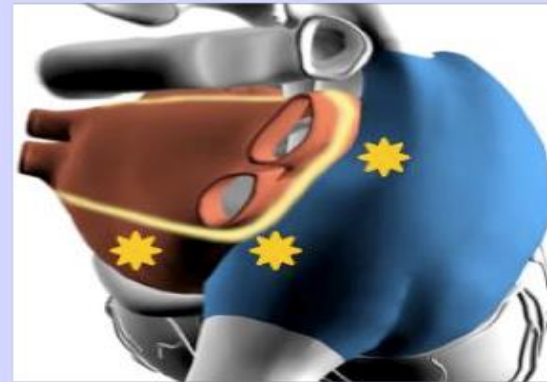
Patients âgés, FA > 10 ans, dilatation OG, FA non paroxystique

Vers une simplification = procédure hybride



THE BOX LESION

- 1) Box lesion = the first step
- 2) further approach (EP)



Quid de la chirurgie de FA isolée en France??

Soin courant en Europe et aux Etats-Unis
(Recommandations)

Matériel connu et utilisé pour l'ablation
concomitante

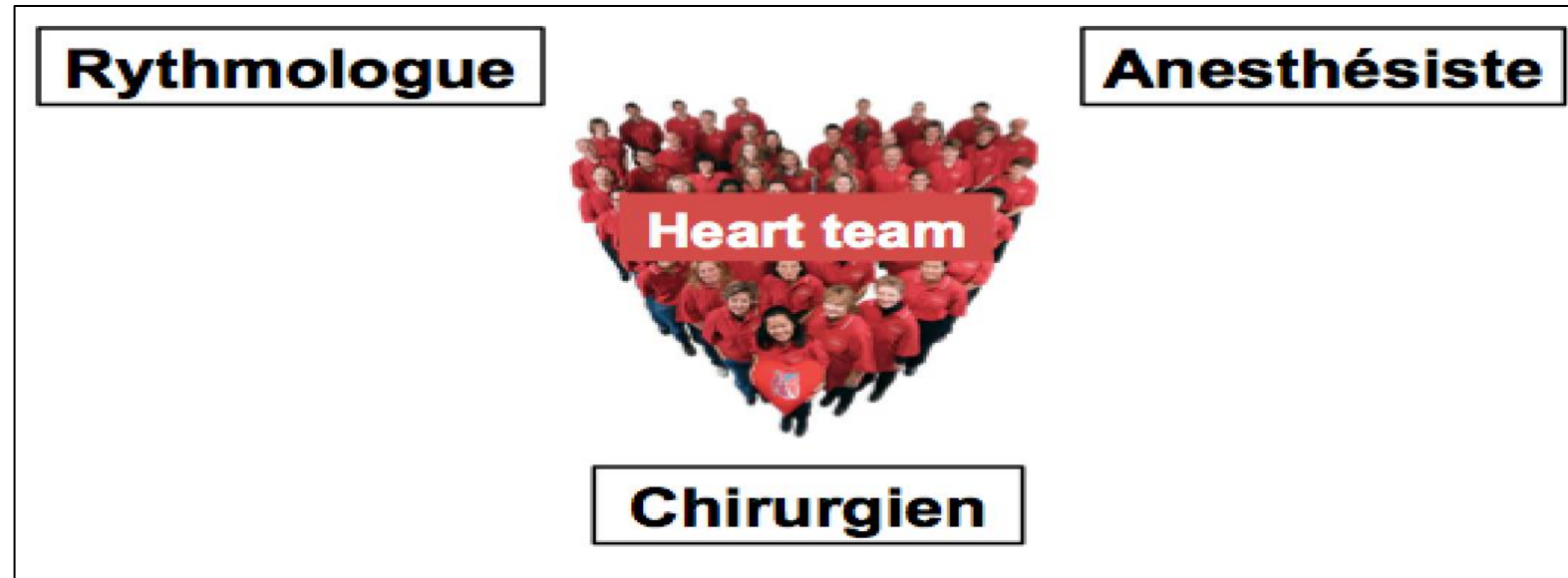
Electrophysiologie au point

Absence de financement du dispositif
médical

Absence d'acte CCAM

Peu de centres pratiquent l'ablation
hybride en routine

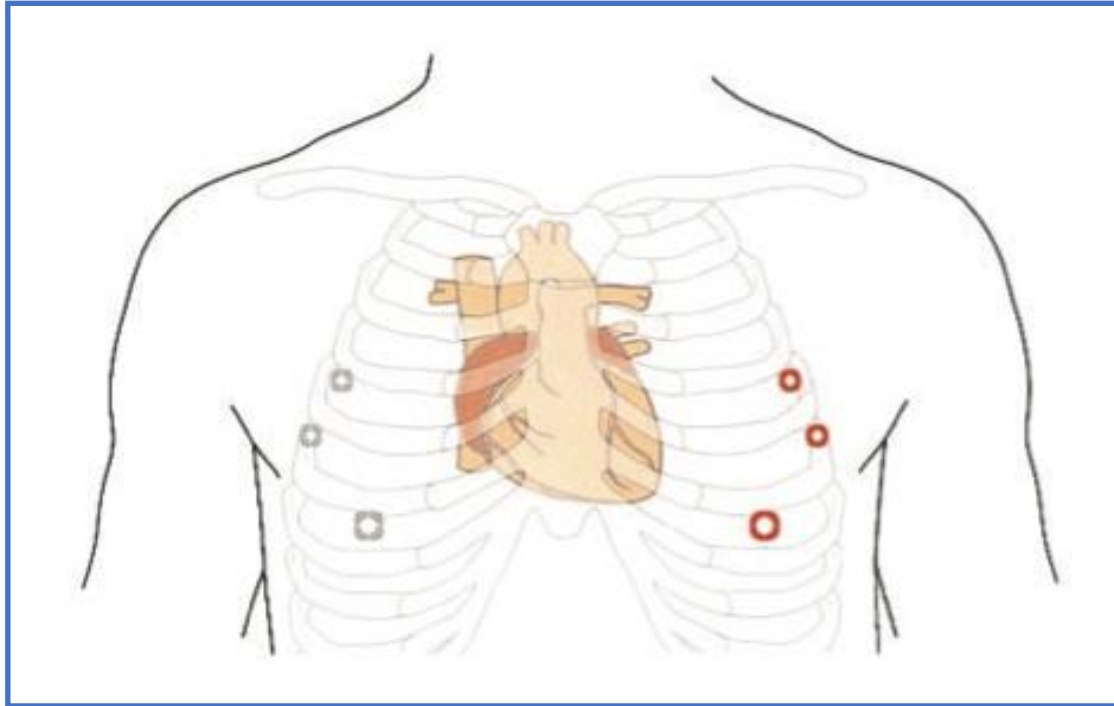
Procédure d'ablation hybride en 2 temps



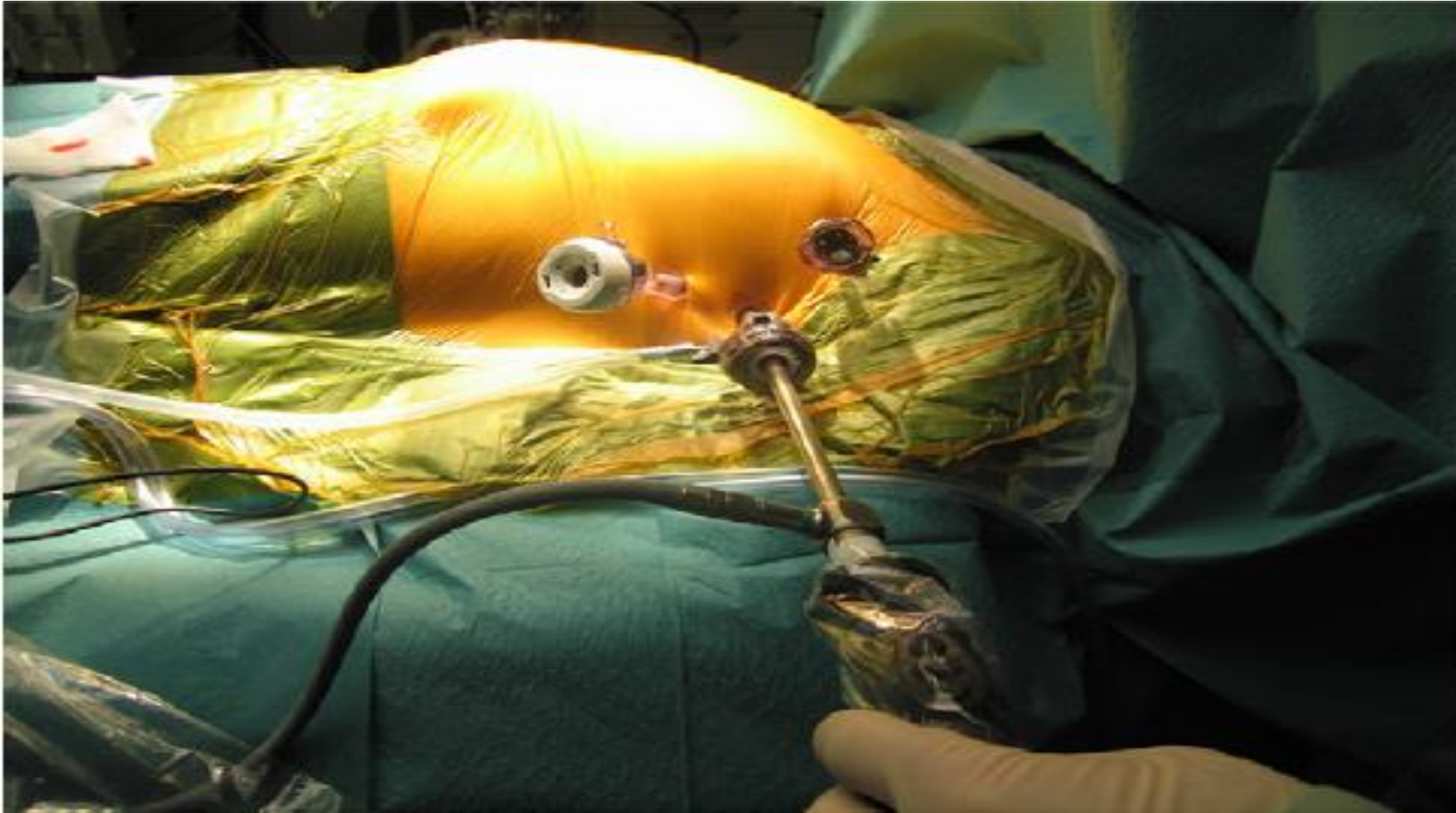
- **1^{er} temps: épicardique (chirurgien)**
- **2^{ème} temps : endocardique (rythmologue)**

Approche thoracoscopique mono ou bilatérale

1^{ere} etape de l'ablation hybride



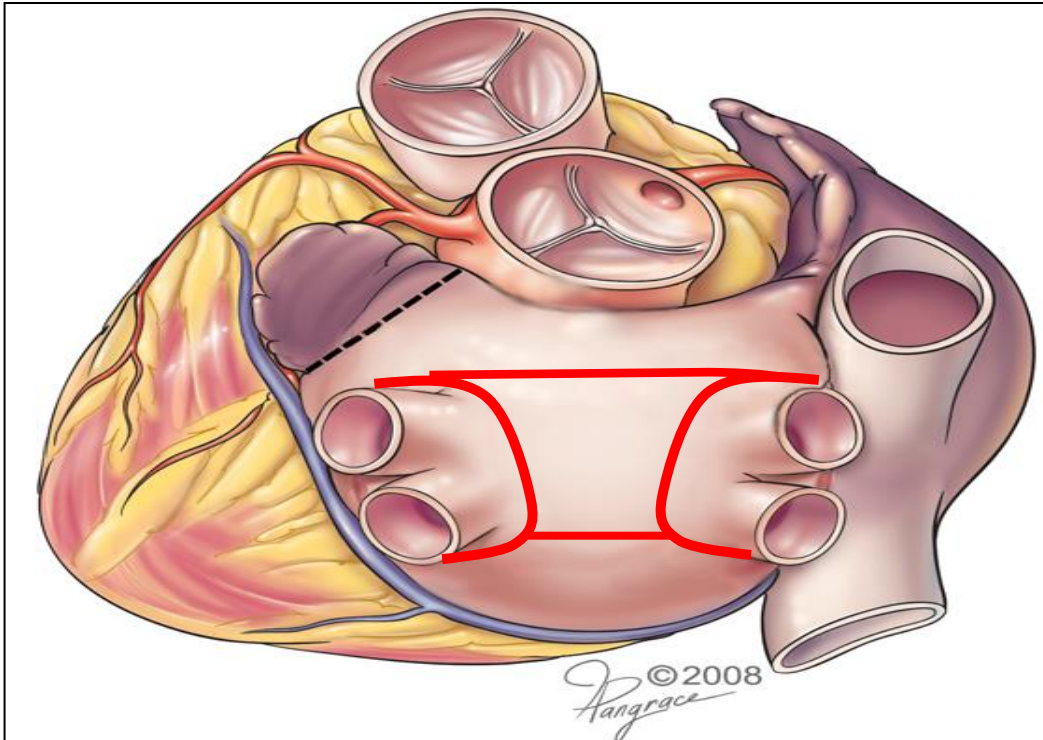
Thoracoscopie gauche et/ou droite sans CEC



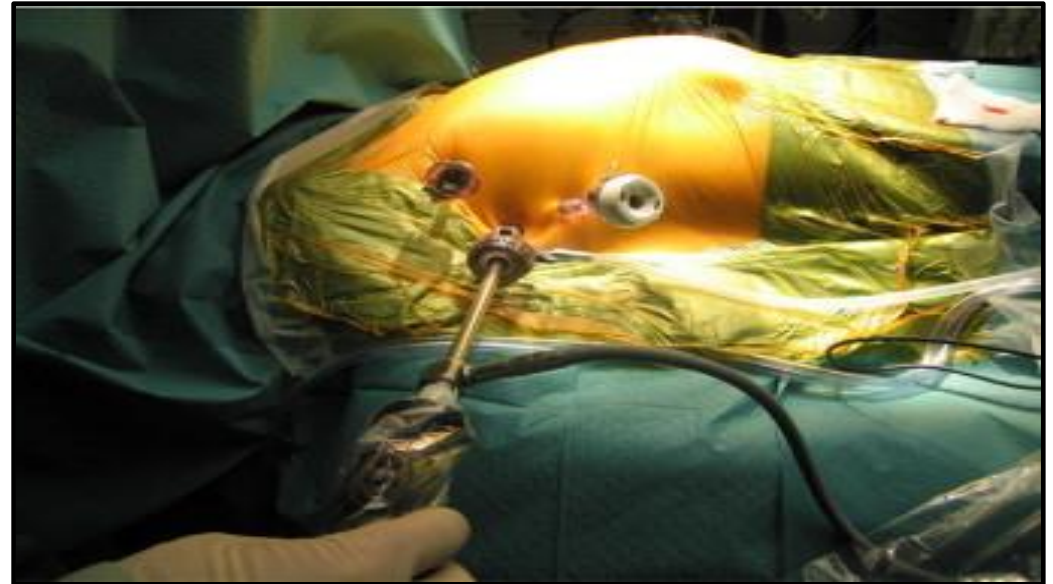
1er Temps : Ablation par radiofréquence épiscopardique

Objectif = Box complète

- Isolation des veines pulmonaires
- Ligne du toit et du plancher



Intubation selective
ETO
Thoracoscopie bilatérale
Insufflation CO₂



Les instruments utilisés par thoracoscopie



Dissecteur avec lumière
à son extrémité



Clamp pour ablation des veines
pulmonaires par RF bipolaire

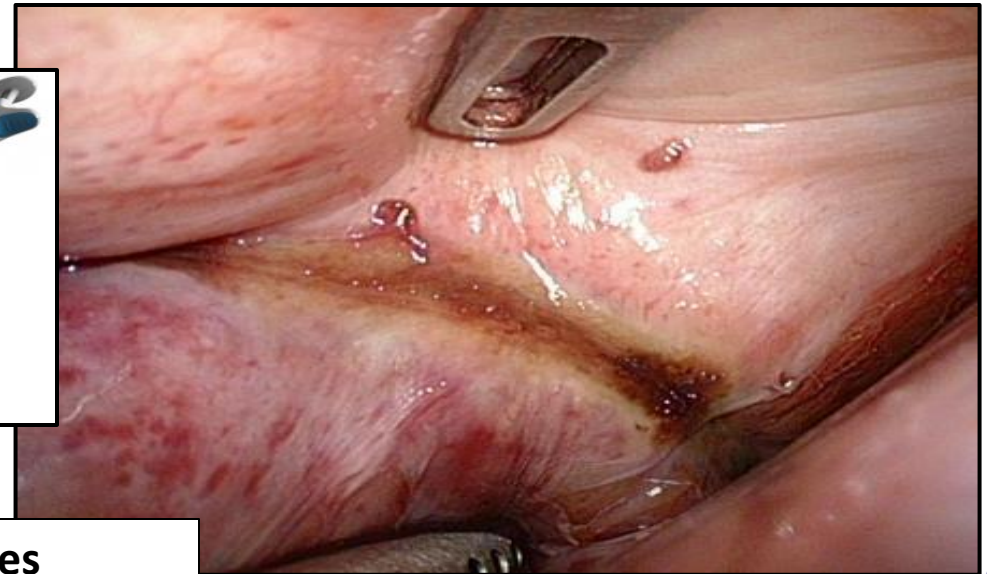
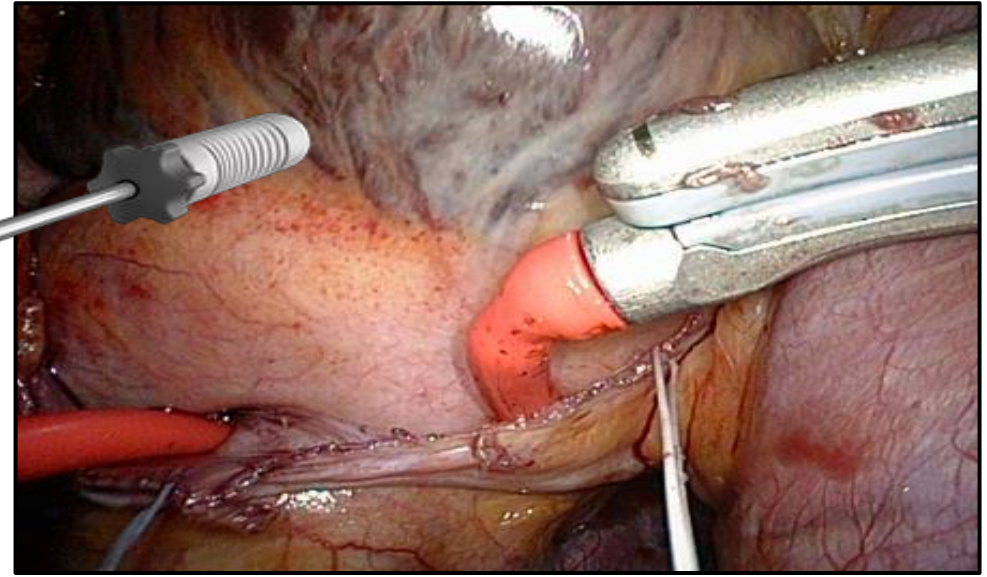
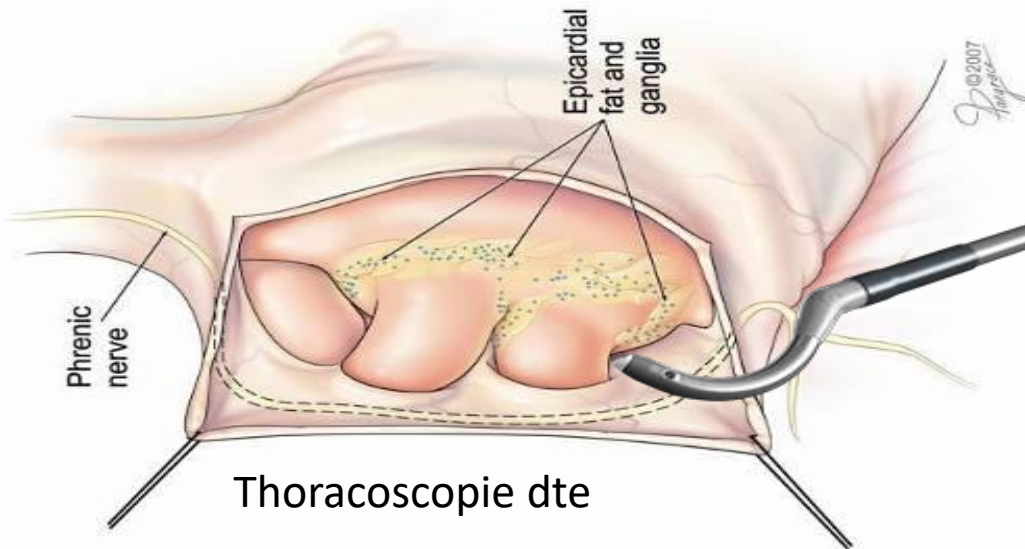


Stilo pour ablation linéaire (toit, plancher,..)
par RF bipolaire
(ablation, sensing, stimulation et pacing)

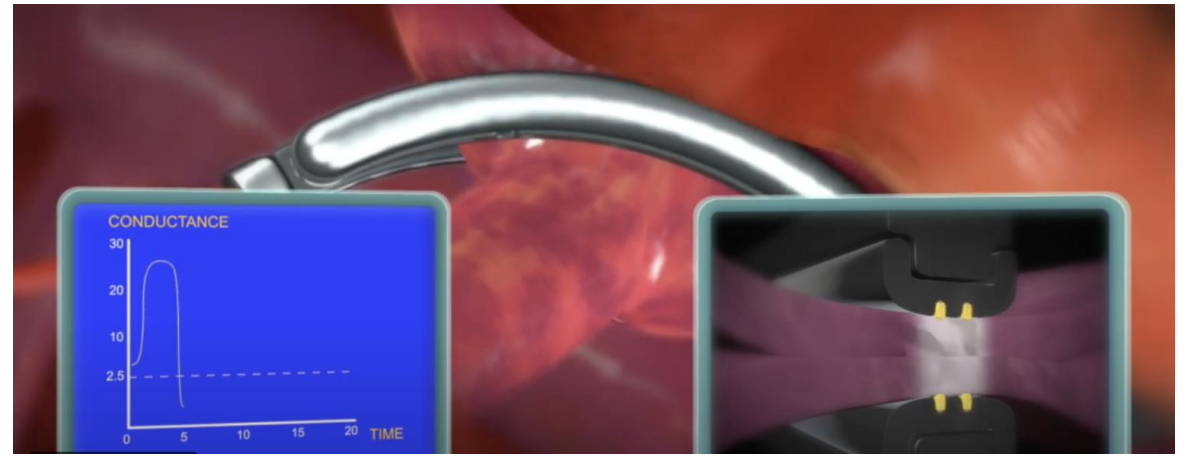
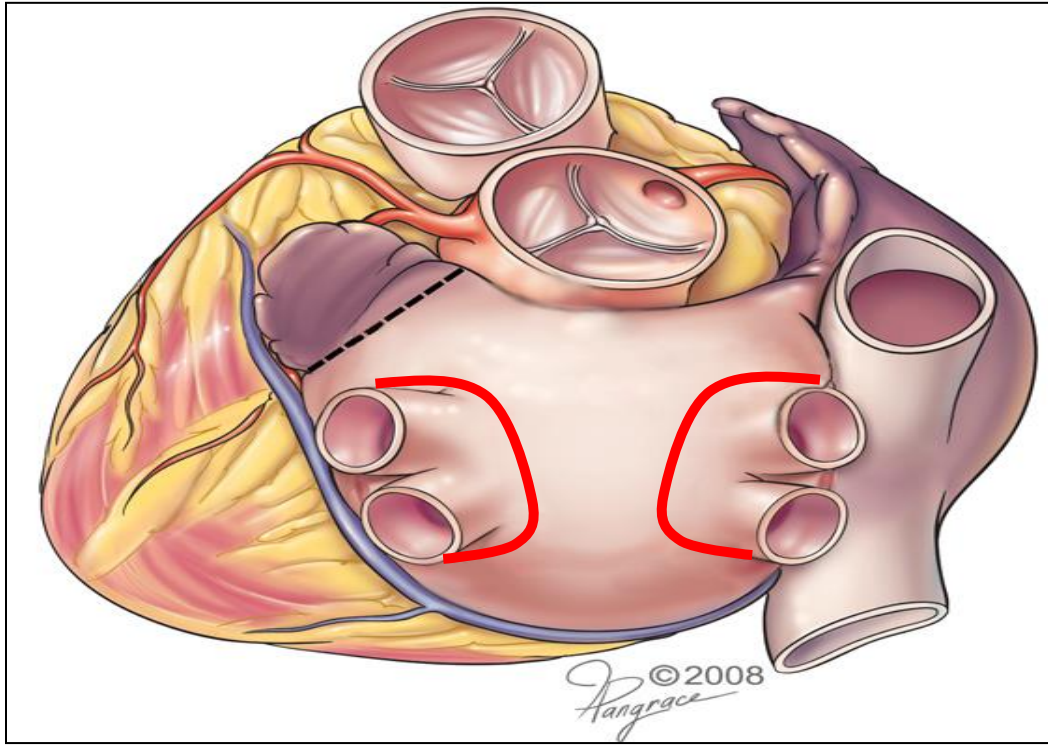


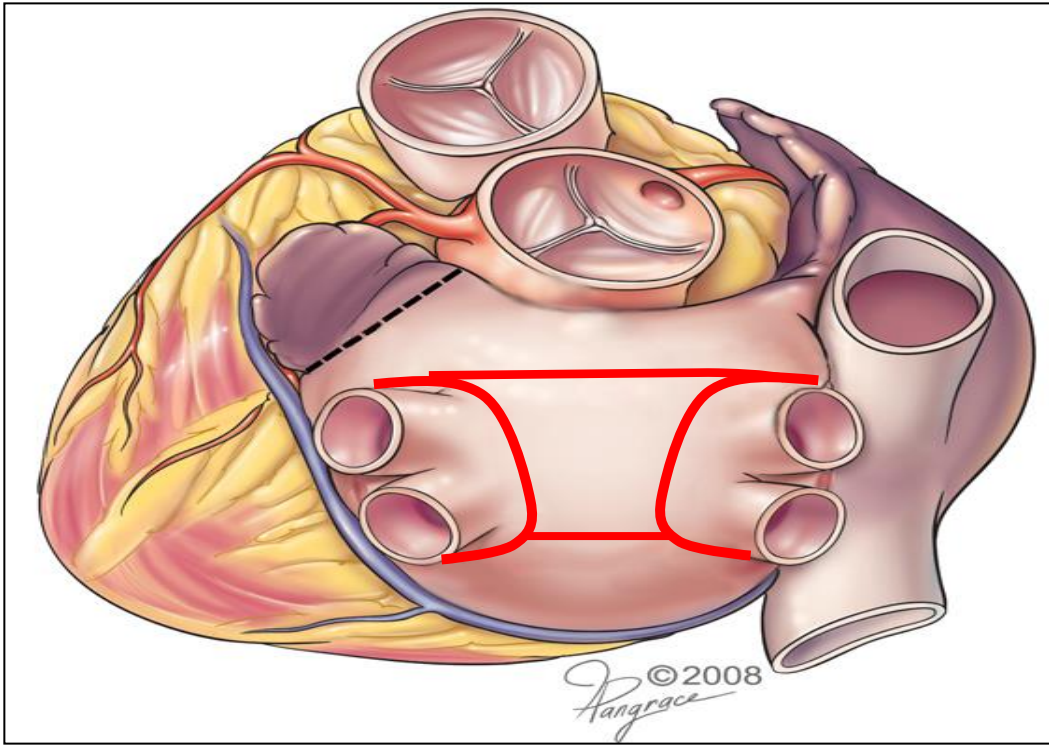
AtriClip dispositif d'occlusion epicardique mécanique
et d'exclusion électrique de l'auricule gauche.

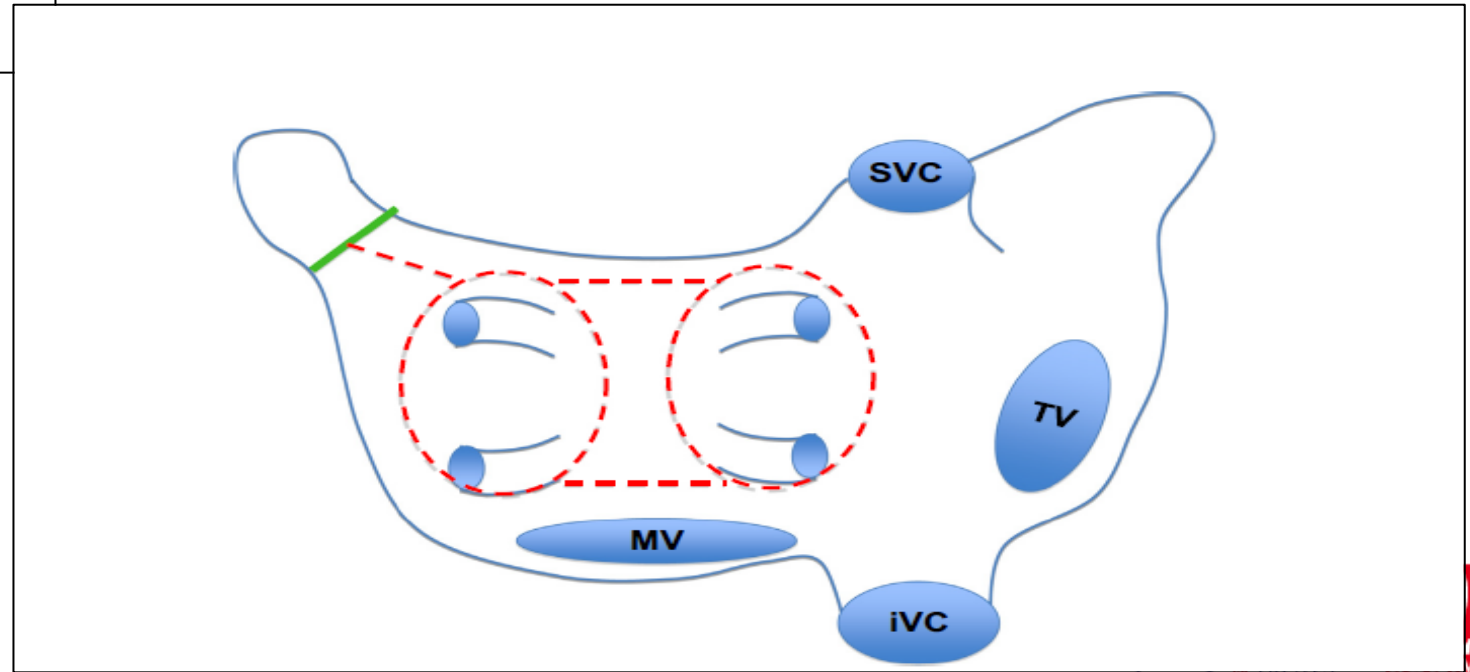
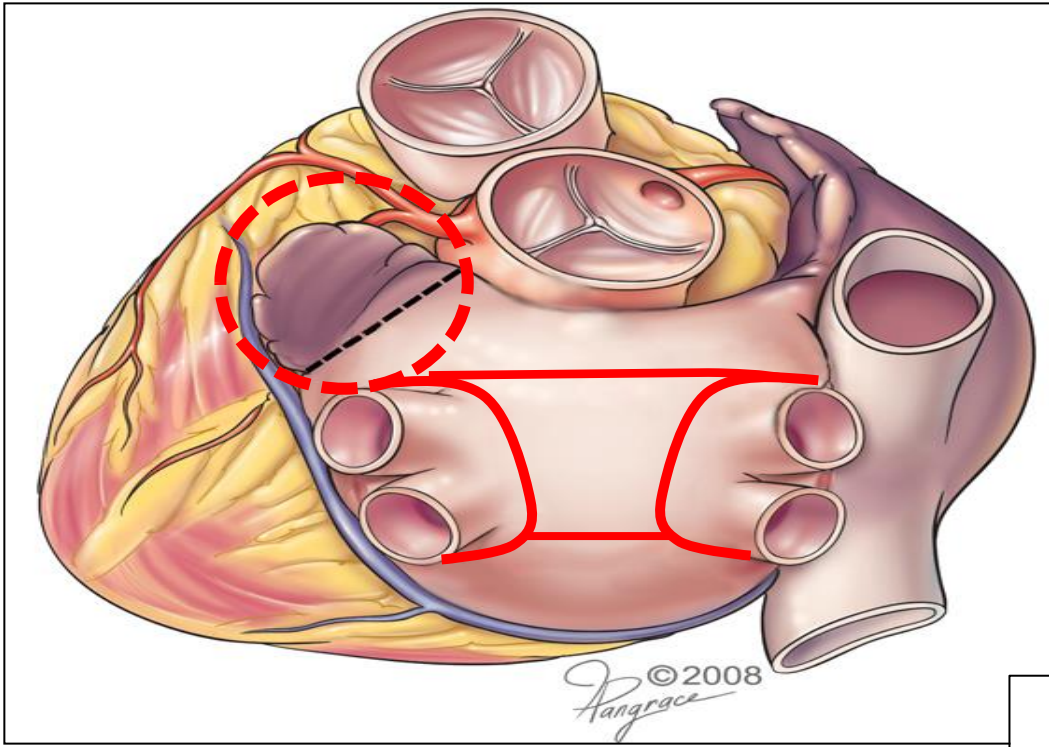
1er Temps : Ablation par radiofréquence épiscardique



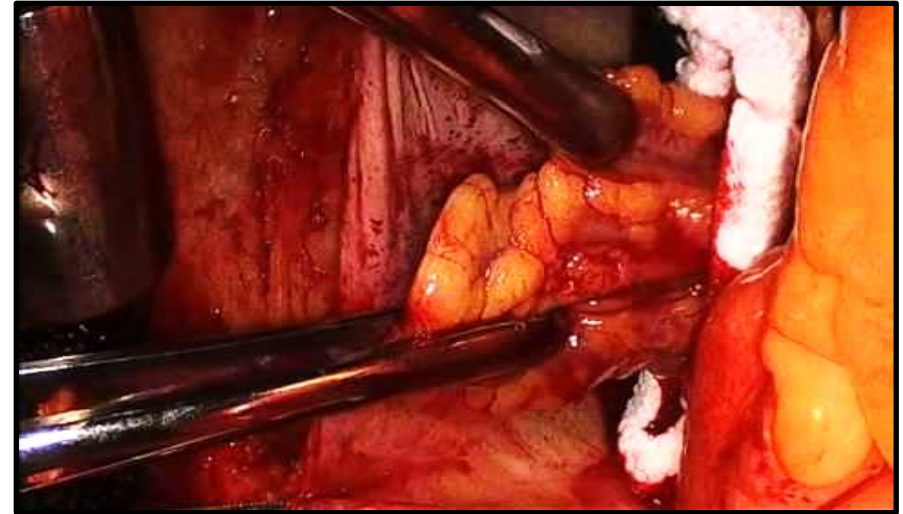
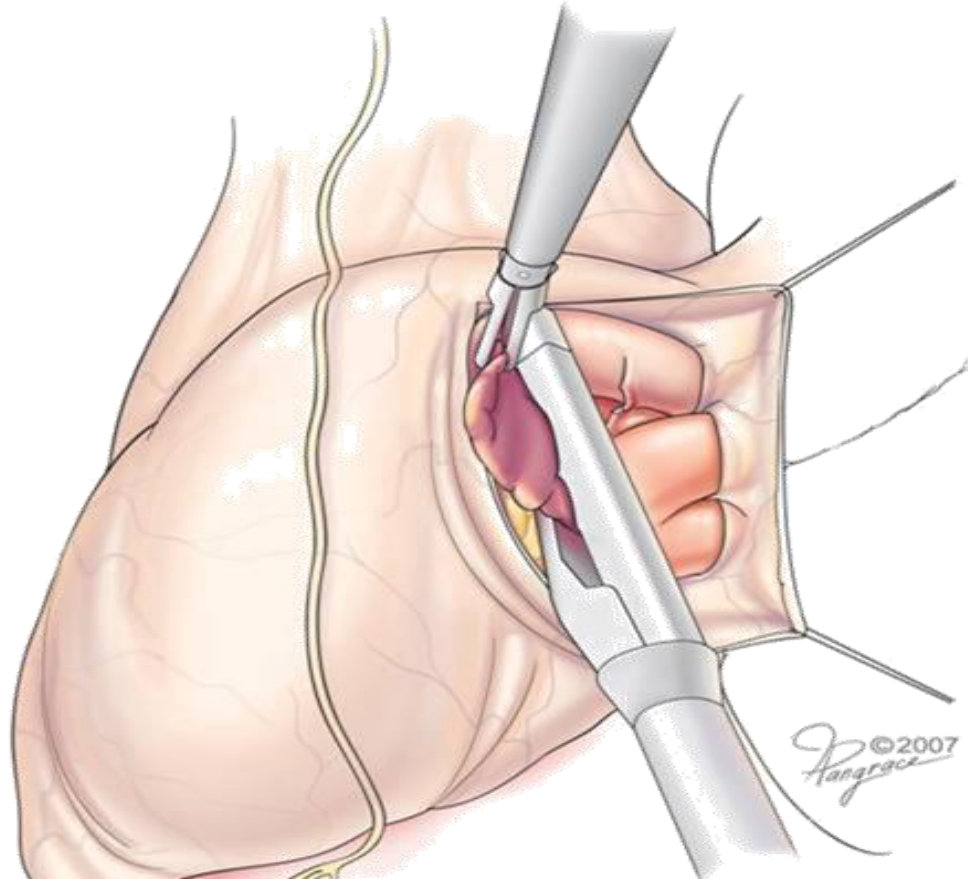
Isolation VP droites







Côté gauche



Exclusion de l'auricule gauche

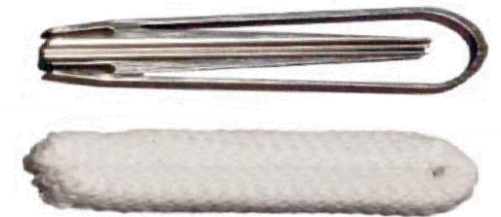
Exclusion AG par AtriClip™ - Résultats

- Au total 922 patients traités par AtriClip.
- **97.8% efficacité d'occlusion:**
 - 95.3% en thoracoscopie
 - 99.2% en ouvert
- Pas d'événements indésirables liés au dispositif
- Pas de complications liées au dispositif
- 0.2% - 1.5% AVC or AIT pts/ans
- 59.7% ont interrompu anticoagulation

AtriClip (AOD1)

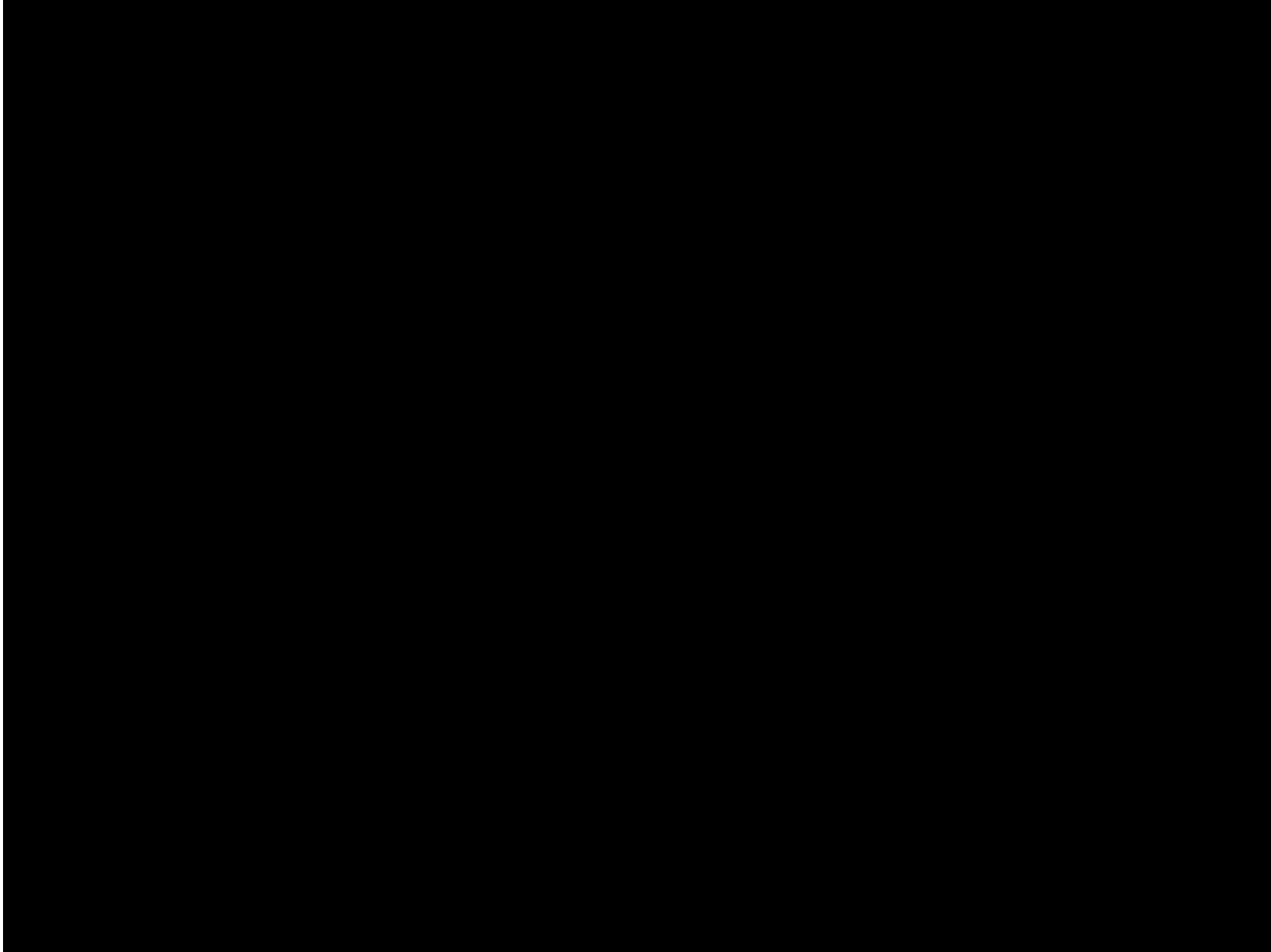


AtriClip PROV (AOD2)



Outcomes of left atrial appendage occlusion using the AtriClip device: a systematic review. Conor Toale, Gerard J. Fitzmaurice, Donna Eatona, Jonathan Lyneb and Karen C. Redmonda. *Interactive CardioVascular and Thoracic Surgery* (2019) 1–8. doi:10.1093/icvts/ivz156

Vidéo ablation chirurgicale



2ème temps : contrôle et ablation endocavitaire

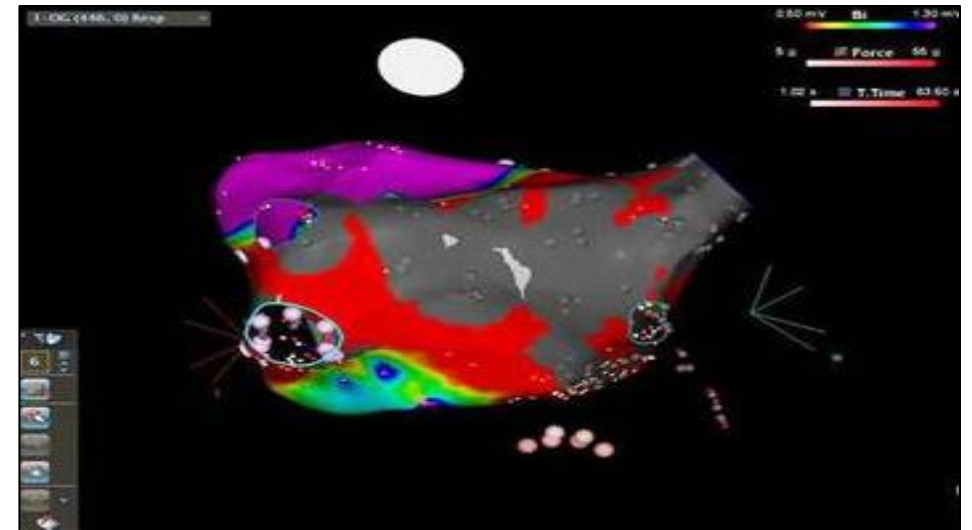
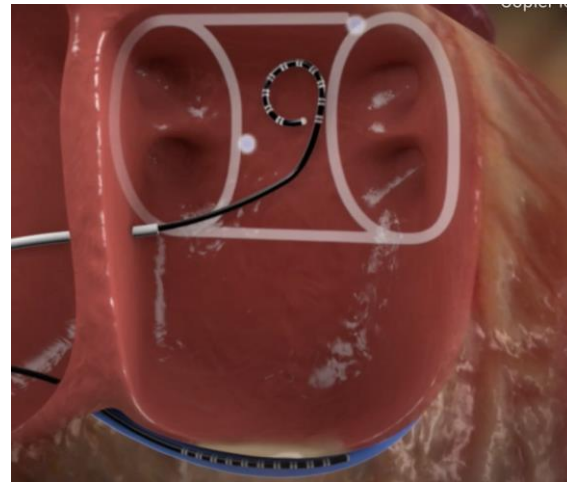
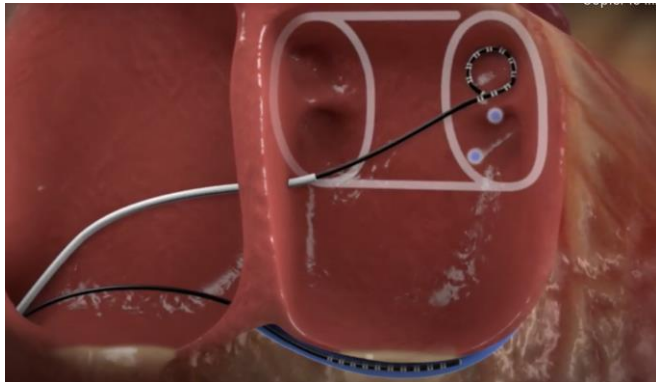
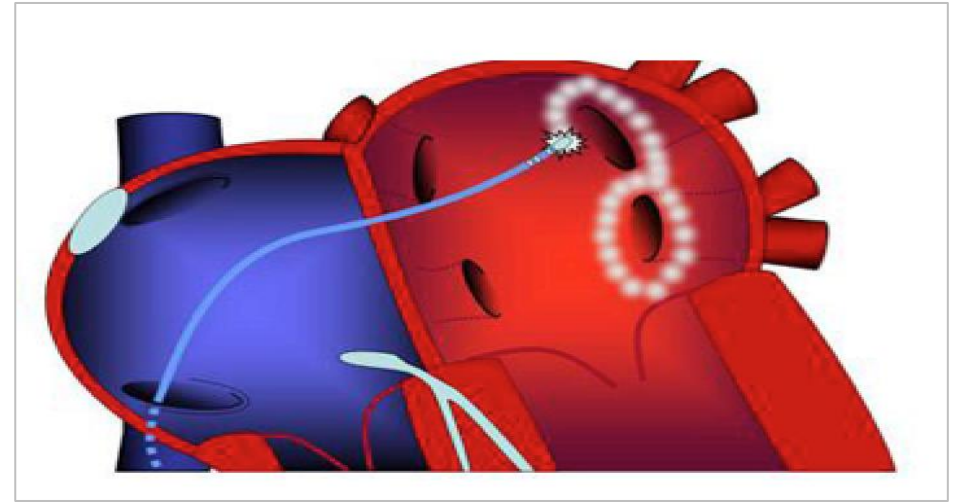
Anticoagulation curative

Abord veineux fémoral
Ponction transeptal

Contrôle lésions épiscopardiques, Mapping

=> Complément ablation par RF

=> isthme G et D



Exemple pour comprendre

- Prenons le cas de Madame L... 66 ans.
- Suivi pour CMD FE à 40%.
- Admise en USIC pour décompensation cardiaque sévère sur passage en FA.
- FE péniblement à 15% malgré contrôle de la fréquence et déplétion avec persistance de signe de bas débit.
- Coro ras
- Bien évidemment on a mis de l'amiodarone... et même beaucoup

Que faire?

Intravenous amiodarone is recommended for cardioversion of AF in patients with HF or structural heart disease, if delayed cardioversion is consistent with clinical situation. [515,591,592](#)

I

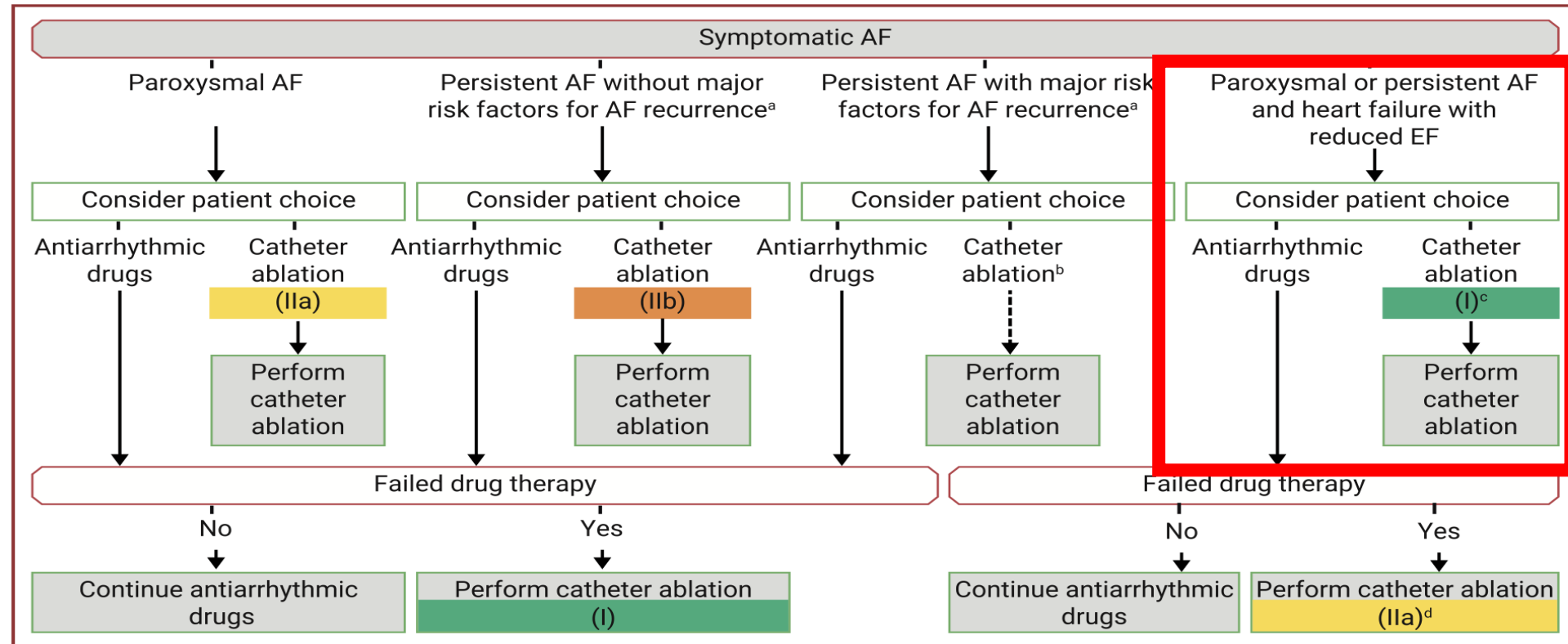
A

Cardioversion of AF (either electrical or pharmacological) is recommended in symptomatic patients with persistent AF as part of rhythm control therapy. [232,233,593,594](#)

I

B

Que faire



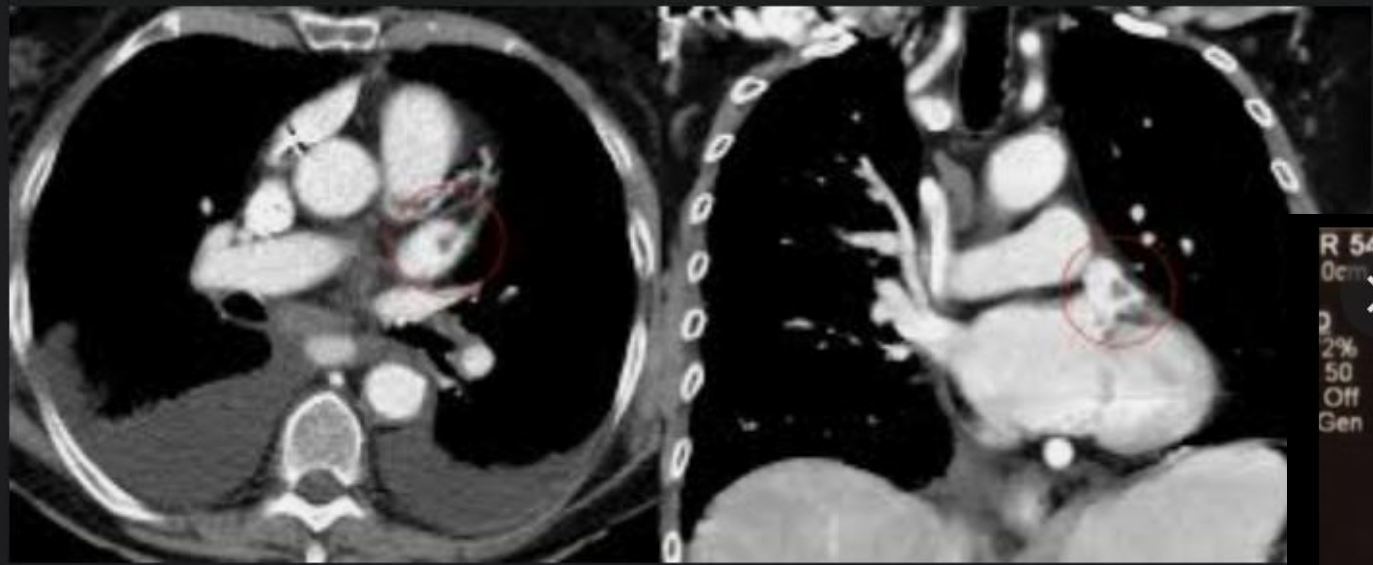
First-line therapy

AF catheter ablation:

- Is recommended to reverse LV dysfunction in AF patients when tachycardia-induced cardiomyopathy is highly probable, independent of their symptom status.^{666,675,676}

I	B
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Pour quel patient?



Présence d'un thrombus de 36 mm de diamètre
Sous Eliquis 5X2 ininterrompu !



Que faire

- Compromet procédure endocavitaire
- Patiente a nouveau en FA, a nouveau avec une FEVG dans les chaussettes
- Sous entresto, cardensiel, eliquis, lasilix 500, CORDARONE (les isglt2 encore pas remboursé pour l'ic)
- FC moyenne a 75-80

Probablement 2 options

Thoracoscopic—including hybrid surgical ablation—procedures should be considered in patients who have symptomatic paroxysmal or persistent AF refractory to AAD therapy and have failed percutaneous AF ablation, or with evident risk factors for catheter ablation failure, to maintain long-term sinus rhythm. The decision must be supported by an experienced team of electrophysiologists and surgeons.^{860,861}

IIa

B

Atrioventricular node ablation should be considered to control heart rate in patients unresponsive or intolerant to intensive rate and rhythm control therapy, and **not eligible for rhythm control by LA ablation**, accepting that these patients will become pacemaker dependent.^{516,523,535,536}

IIa

B

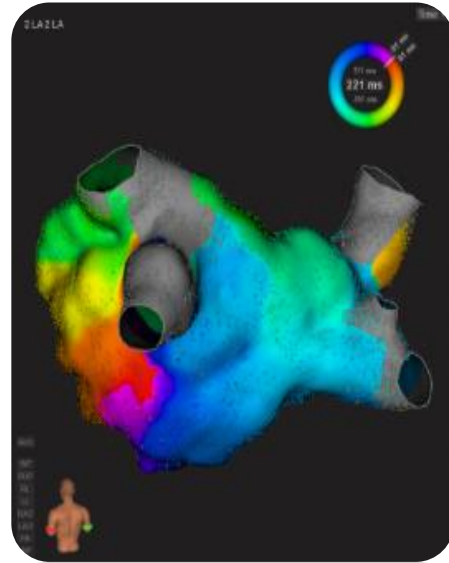
Evolution

- Geste réalisé fin mars 2021. Sortie sinusale
- Malheureusement récurrence des avril de la FA avec nouvelle poussée d'IC
- Donc reprise en endocavitaire comme prévu pour complément d'ablation

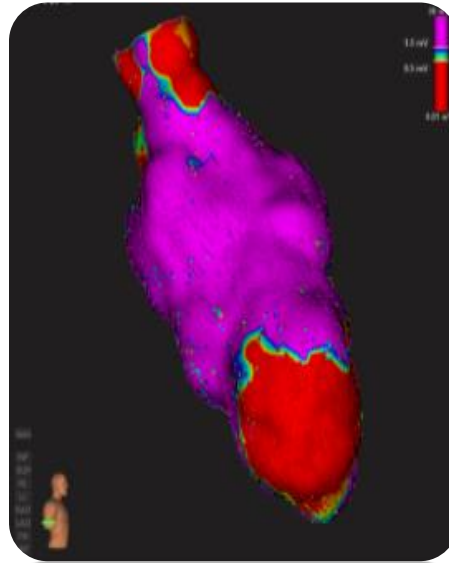
Principe de la cartographie



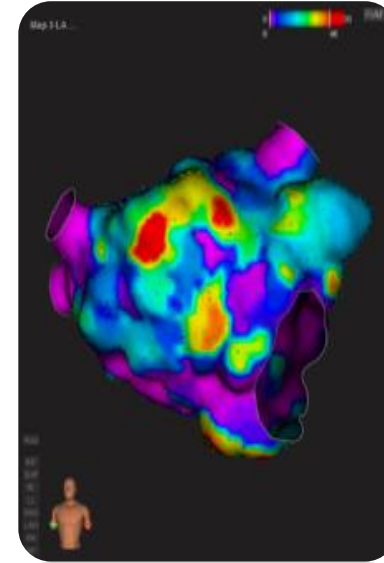
Anatomique



Activation /
Propagation

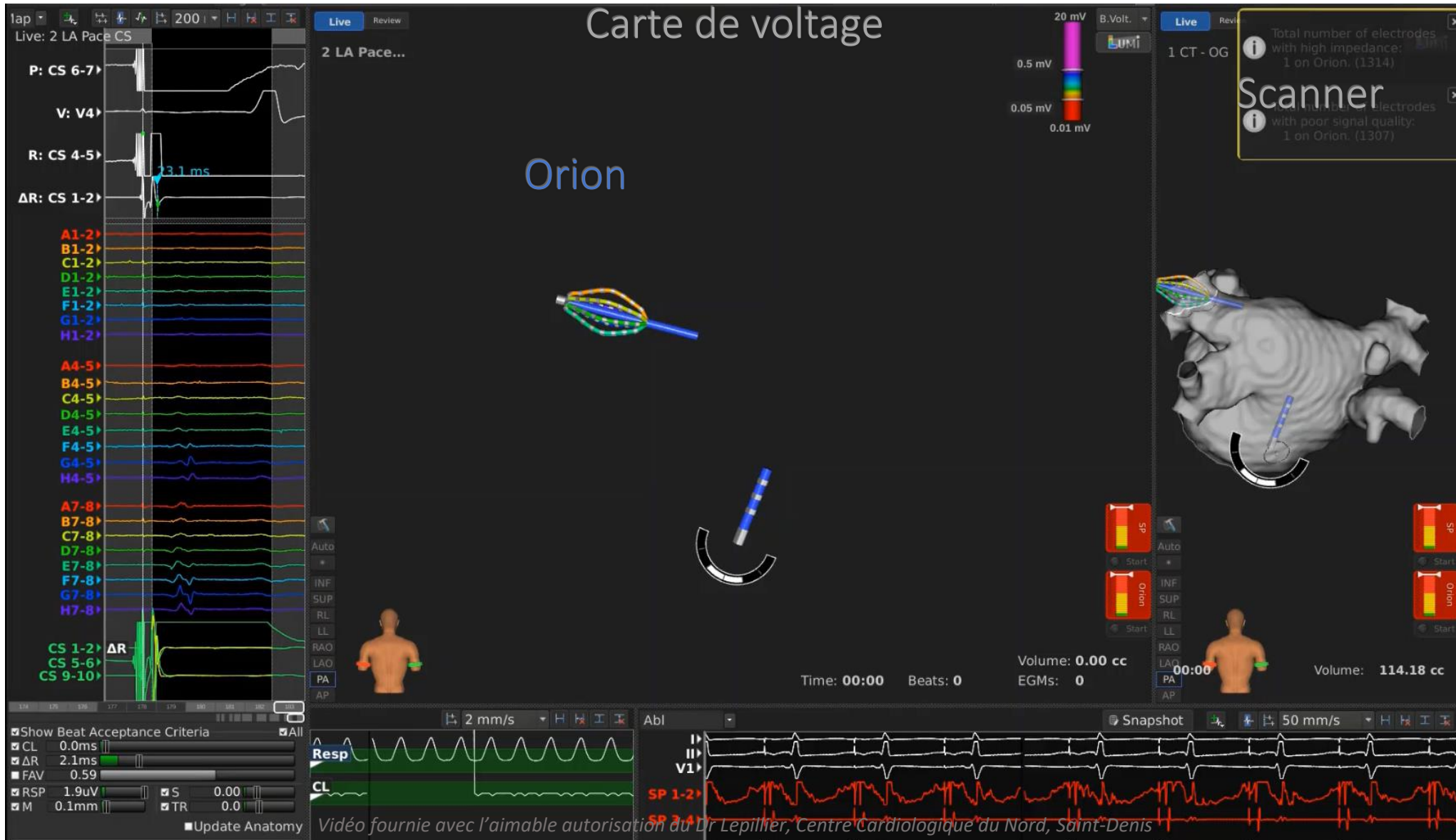


Voltage



Potentiers
fragmentés

Cartographie anatomique et de voltage de l'OG

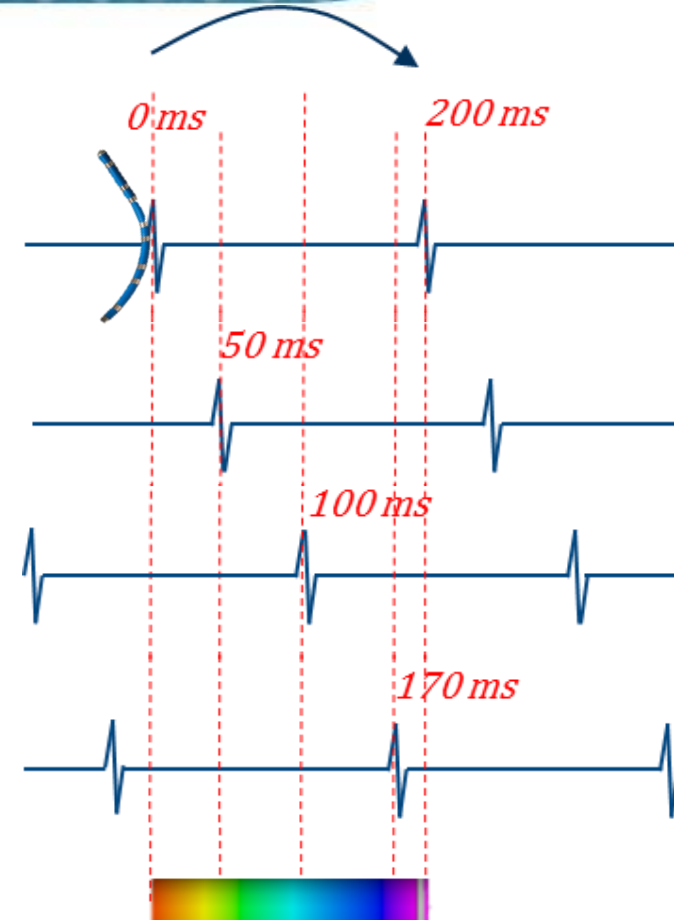
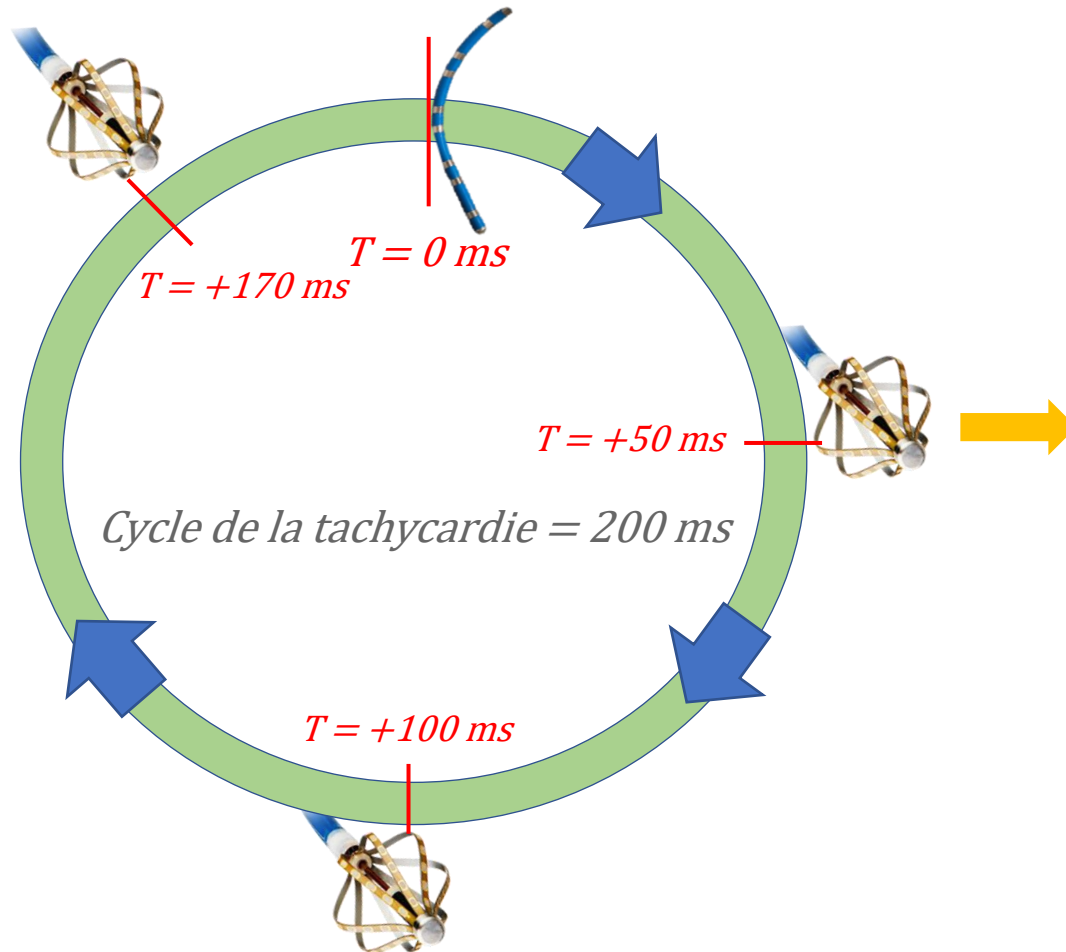


Vidéo fournie avec l'aimable autorisation du Dr Lepillier, Centre Cardiologique du Nord, Saint-Denis

Principe de la carte d'activation

Principe de cartographie d'une tachycardie

Sinus Coronaire : référence $T=0ms$

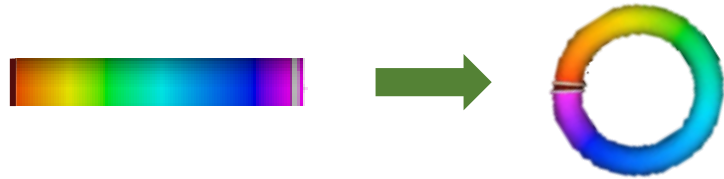


On associe des couleurs aux délais

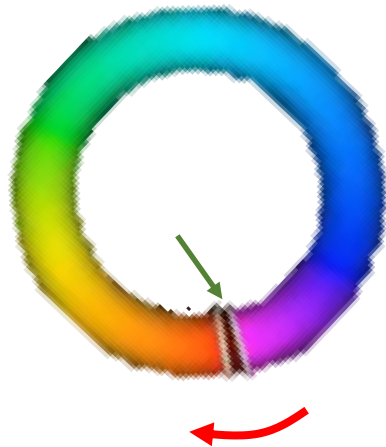
Cartographie

RHYTHMIA HDx™
MAPPING SYSTEM

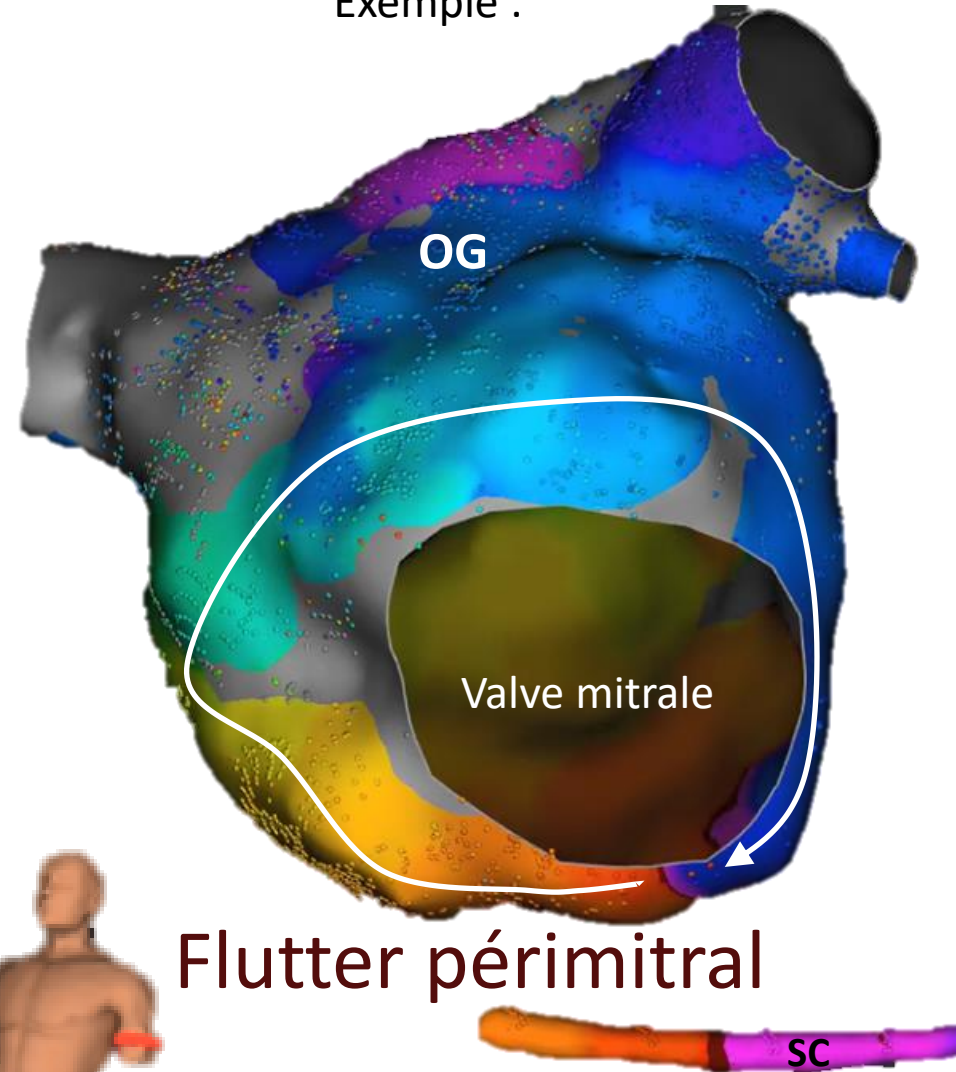
Considérons que la tachycardie est une boucle, aussi appelée « macro-réentrée », dans ce cas on représente l'arc en ciel de couleur de manière circulaire.



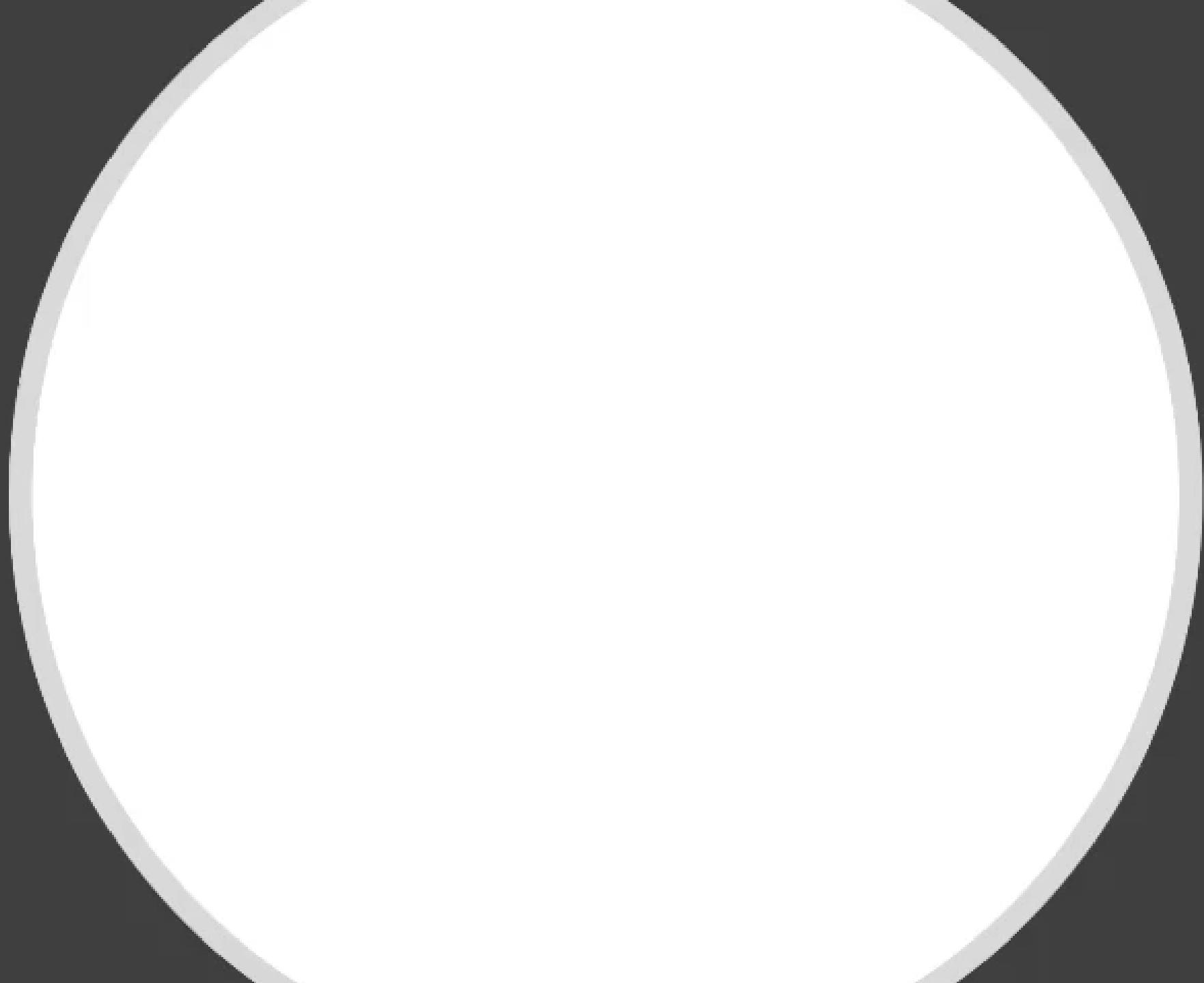
Ensuite pour interpréter une carte on suit les couleurs de l'arc en ciel dans l'ordre

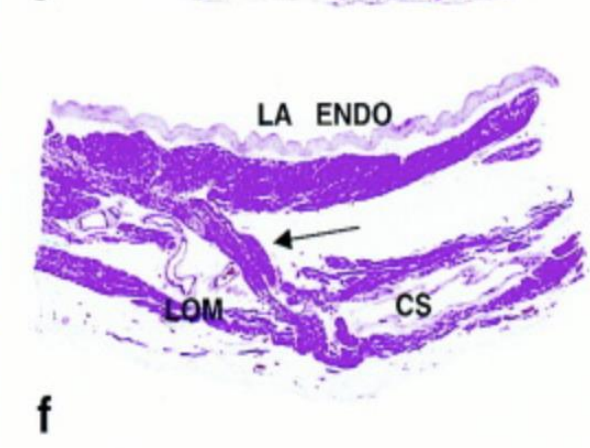
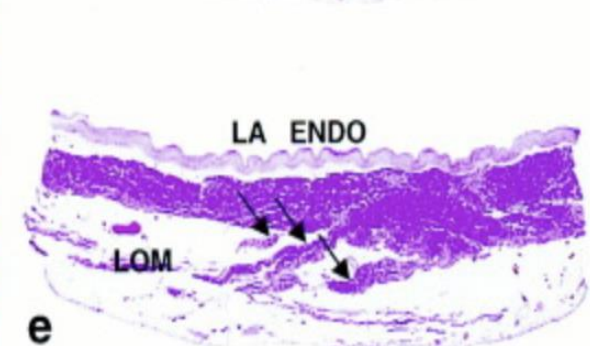
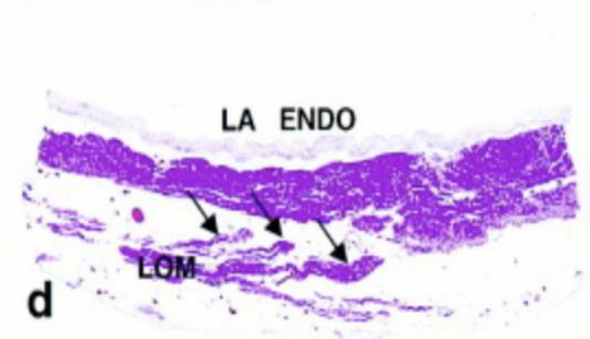
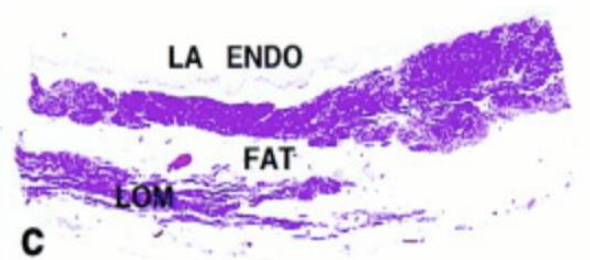
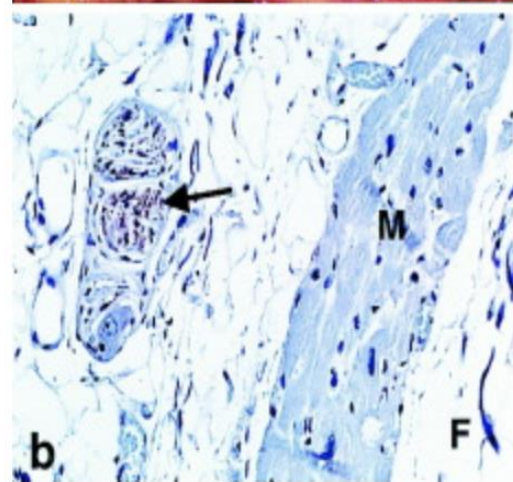
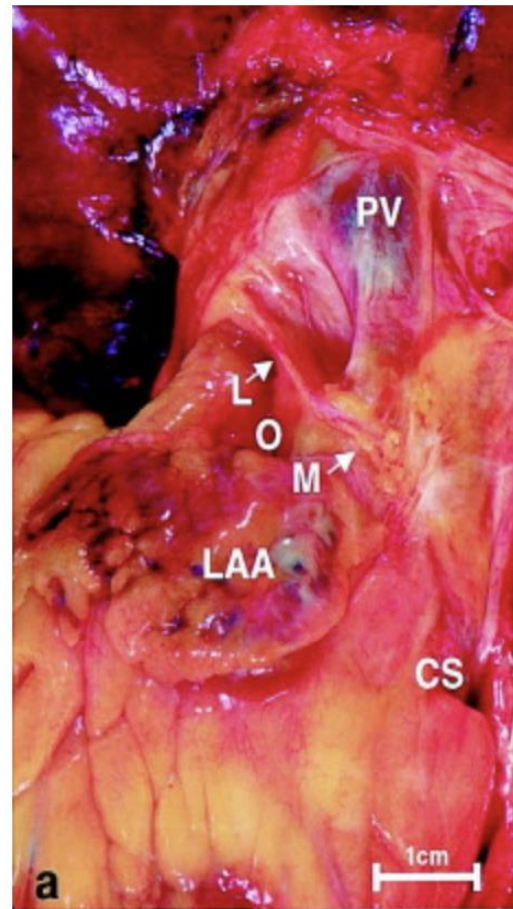
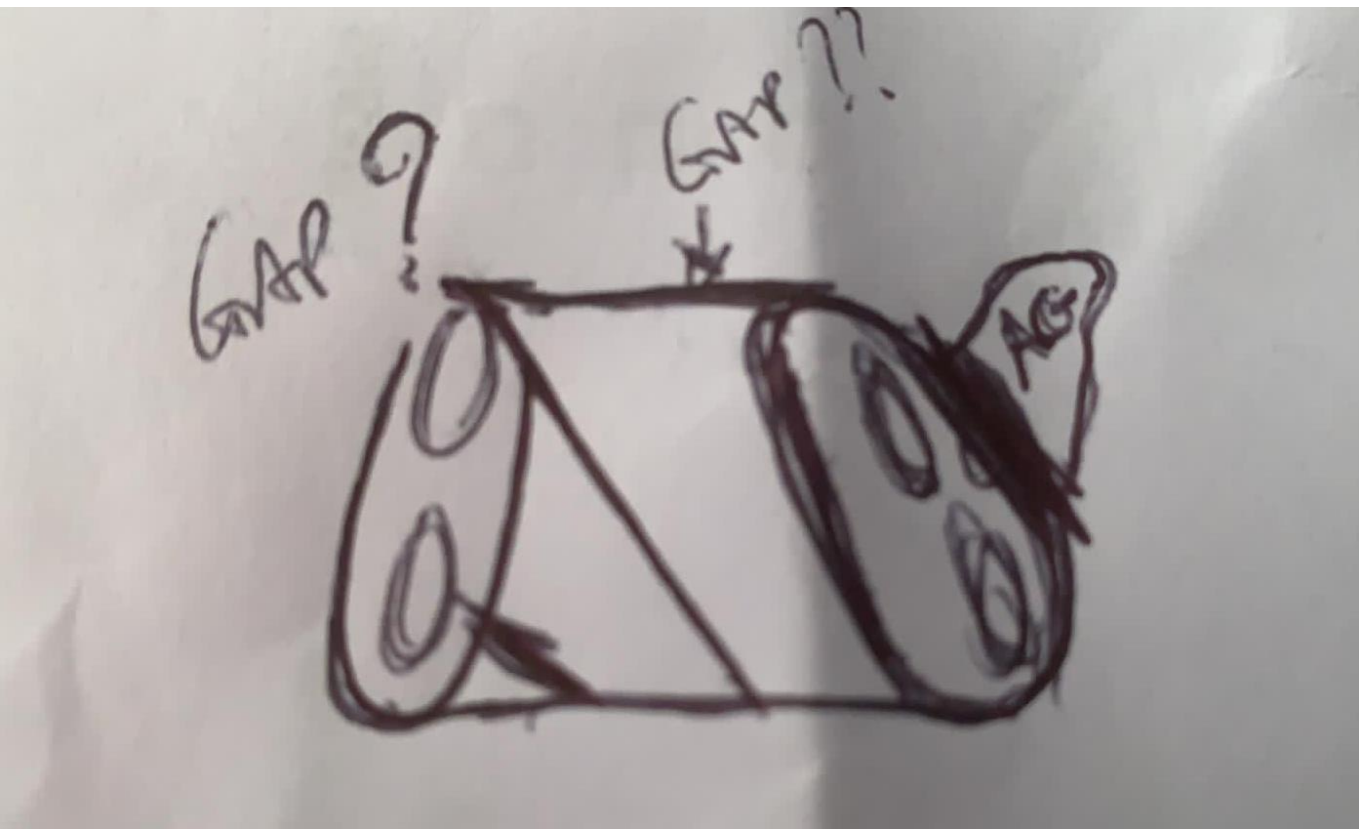


Exemple :



Flutter périmitral





Finalemment

- Sinusale depuis mai 2021
- Pas de récurrence d'arythmie
- FEVG remontée à 40% versus 15%
- Pas de ré-hospitalisation

TT-MAZE vs Catheter Ablation in persistent and long-standing persistent AF

- metanalysis including 34 studies
- TT-Maze population included more dilated LA and inferior LVEF at baseline
- Primary endpoint = percentage of patients in SR after at least 12 months of follow-up, without the use of AADs

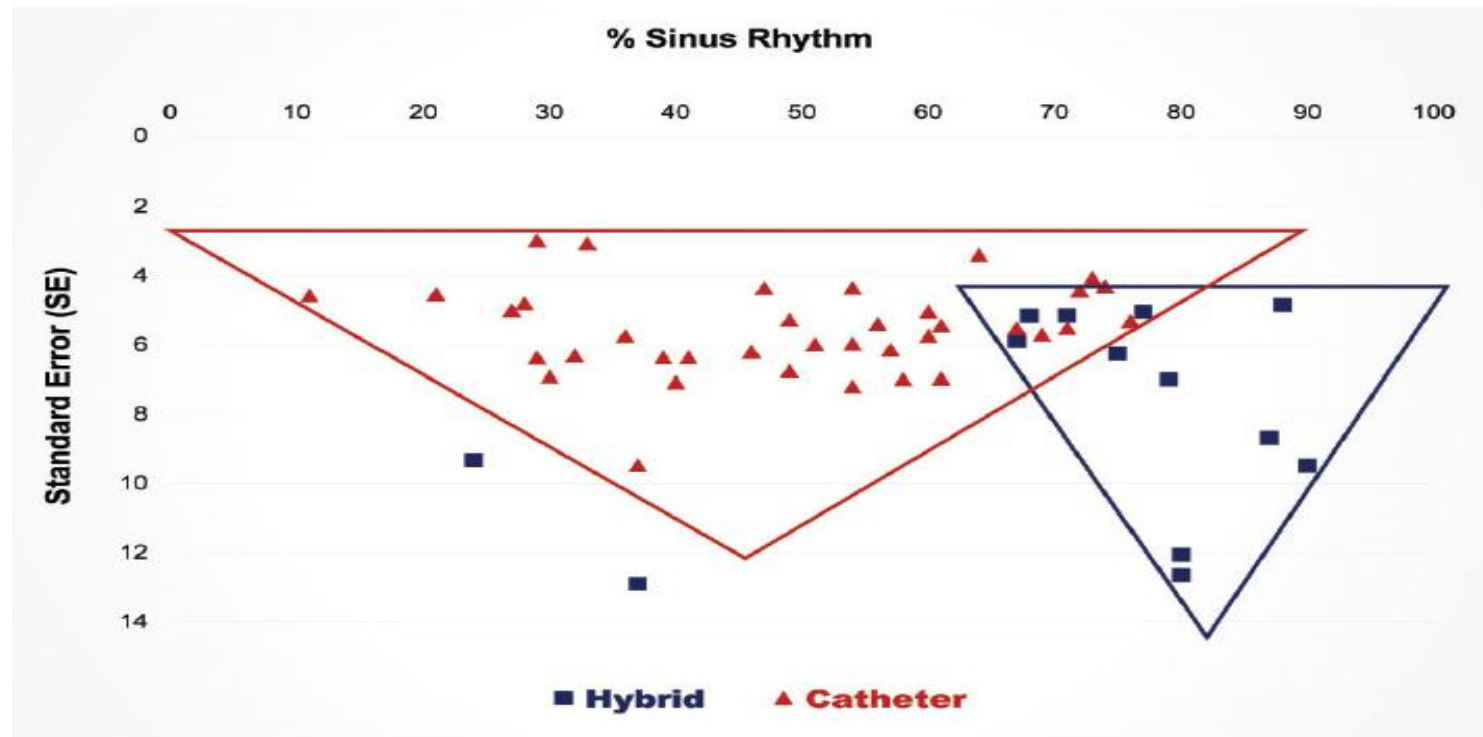
Table 1: Differences in characteristics between hybrid and catheter studies at baseline

Characteristics	Hybrid (total patients, n = 574)	Catheter (total patients, n = 3291)	P-value
Age (years)	60.2 (58.3–62.2)	59.9 (58.9–60.9)	0.765
Females (%)	20.4 (15.9–24.9)	24.3 (22.0–26.6)	0.129
Longstanding persistent AF (%)	53.5 (30.8–76.1)	49.6 (36.3–62.8)	0.771
Left atrial dimension (mm)	49.2 (47.6–50.7)	45.4 (44.7–46.2)	0.001
LVEF (%)	52.6 (49.9–55.3)	57.9 (56.4–59.4)	0.001
Body mass index (kg/m ²)	29.4 (27.7–31.1)	28.6 (27.5–29.7)	0.394
Hypertension (%)	60.3 (51.9–68.6)	56.1 (51.6–60.6)	0.387
Diabetes mellitus (%)	20.4 (13.1–27.7)	13.2 (8.7–17.6)	0.096

- van der Heijden CAJ, Vroomen M, Luermans JG, Vos R, Crijns HJGM, Gelsomino S et al. Hybrid versus catheter ablation in patients with persistent and longstanding persistent atrial fibrillation: a systematic review and meta-analysis. Eur J Cardiothorac Surg 2019

TT-MAZE vs Catheter Ablation in persistent and long-standing persistent AF

Hybrid ablation was more effective in maintaining SR than a single catheter ablation (70.7% vs 49.9%, $P < 0.001$).



- van der Heijden CAJ, Vroomen M, Luermans JG, Vos R, Crijns HJGM, Gelsomino S et al. Hybrid versus catheter ablation in patients with persistent and longstanding persistent atrial fibrillation: a systematic review and meta-analysis. Eur J Cardiothorac Surg 2019

TT-MAZE vs Catheter Ablation in persistent and long-standing persistent AF

- Although overall mortality and morbidity of both techniques is low, hybrid ablation has a slightly higher complication rate than catheter ablation

	Hybrid		Catheter		P-value
Primary outcome					
SR after ≥ 12 months of follow-up	70.7% (61.2–80.2)		49.9% (44.7–55.2)		0.000
Complications	Number of patients per complication of total group (n = 574)	Adjusted mean (95% CI)	Number of patients per complication of total group (n = 53 291)	Adjusted mean (95% CI)	
Bleeding requiring reoperation	n = 1	0.9% (0.1–1.7)	n = 0	0.4% (0.2–0.6)	0.074
Bleeding requiring transfusion	n = 17	1.6% (0.6–2.7)	n = 0	0.4% (0.2–0.7)	0.000
Conversion to sternotomy	n = 7	1.1% (0.2–1.9)	n = 0	0.4% (0.2–0.7)	0.010
Groin haematoma requiring therapy	n = 1	0.9% (0.2–1.7)	n = 35	0.6% (0.3–0.9)	0.602
Hospital mortality	n = 7	1.1% (0.3–2.0)	n = 1	0.5% (0.2–0.7)	0.007
Pacemaker implantation	n = 3	1.0% (0.2–1.8)	n = 3	0.4% (0.2–0.7)	0.041
Phrenic nerve injury	n = 10	1.2% (0.3–2.1)	n = 3	0.4% (0.2–0.7)	0.002
Pneumothorax	n = 4	1.0% (0.2–1.8)	n = 1	0.4% (0.2–0.7)	0.033
Pulmonary vein narrowing requiring stenting	n = 1	0.9% (0.2–1.7)	n = 1	0.5% (0.2–0.7)	0.074
Pulmonary vein narrowing (insignificant)	n = 7	1.0% (0.2–1.8)	n = 4	0.4% (0.2–0.7)	0.007
Stroke/TIA	n = 4	0.9% (0.2–1.7)	n = 27	0.8% (0.5–1.1)	0.302
Tamponade	n = 9	1.7% (0.6–2.7)	n = 32	0.7% (0.4–1.0)	0.049

- van der Heijden CAJ, Vroomen M, Luermans JG, Vos R, Crijns HJGM, Gelsomino S et al. Hybrid versus catheter ablation in patients with persistent and longstanding persistent atrial fibrillation: a systematic review and meta-analysis. Eur J Cardiothorac Surg 2019

TT-MAZE vs Catheter Ablation

A recent randomized trial

Hybrid Ablation Versus Repeated Catheter Ablation in Persistent Atrial Fibrillation

A Randomized Controlled Trial

Claudia A.J. van der Heijden, MD,^{a,*} Vanessa Weberndörfer, MD,^{b,c,*} Mindy Vroomen, MD, PhD,^{b,d}
 Justin G. Lermans, MD, PhD,^{b,c} Sevasti-Maria Chaldoupi, MD, PhD,^{b,c} Elham Bidar, MD, PhD,^{a,c}
 Kevin Vernooij, MD, PhD,^{b,c} Jos G. Maessen, MD, PhD,^{a,c} Laurent Pison, MD, PhD,^e Sander M.J. van Kuijk,^f
 Mark La Meir, MD, PhD,^{a,g} Harry J.G.M. Crijns, MD, PhD,^{b,c} Bart Maesen, MD, PhD^{a,c}

JACC 2023 in press

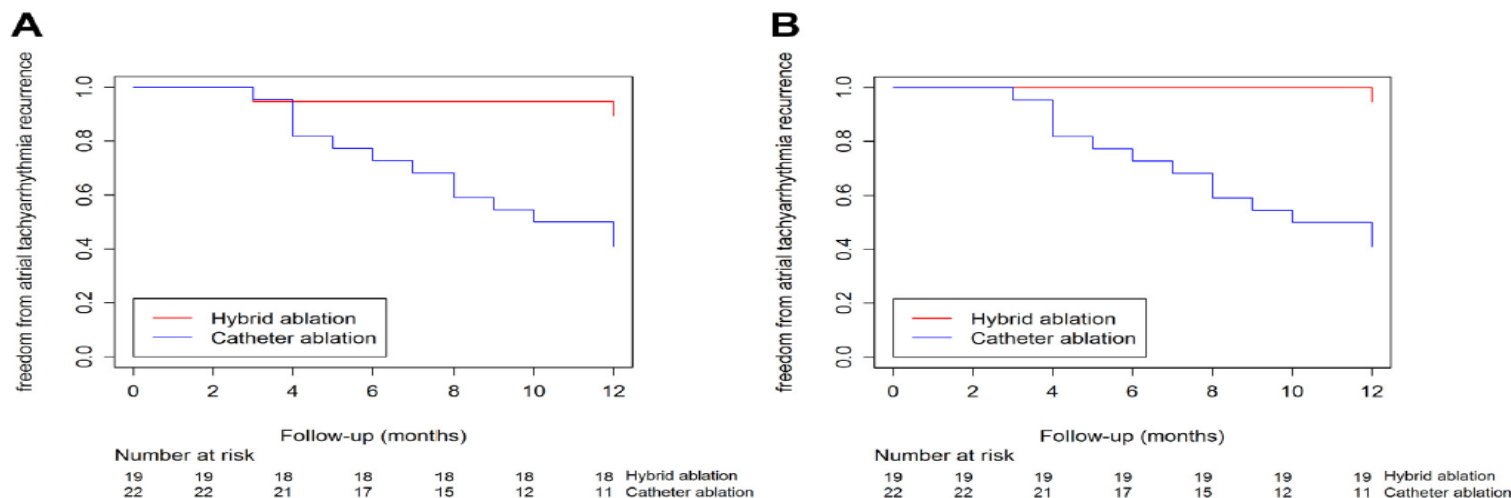
TABLE 1 Baseline Characteristics and Comorbidities Comparing HA vs CA

	HA (n = 19)	CA (n = 22)
Demographics (n = 41)		
Age (y)	64 ± 9	64 ± 8
Female	1 (5)	4 (18)
BMI (kg/m ²)	28.4 ± 4	29.2 ± 4
CHA ₂ DS ₂ VASC >3	10 (53)	6 (27)
Congestive heart failure	1 (5)	6 (27)
COPD	2 (10)	0 (0)
Coronary artery disease	1 (5)	2 (9)
Diabetes mellitus	4 (21)	3 (14)
Hypertension	10 (53)	15 (68)
Kidney dysfunction (eGFR <50 mL/min)	1 (5)	1 (5)
OSAS	5 (26)	3 (14)
PAOD	1 (5)	2 (9)
AF history		
AAD use	10 (53)	8 (36)
Class I	8 (42)	7 (32)
Class III	2 (11)	2 (9)
AF duration (mo)	22 (6–455)	33 (12–221)
Persistent AF	17 (90)	20 (91)
Long-standing AF	2 (11)	2 (9)

TT-MAZE vs Catheter Ablation

A recent randomized trial

FIGURE 2 Arrhythmia-Free Survival

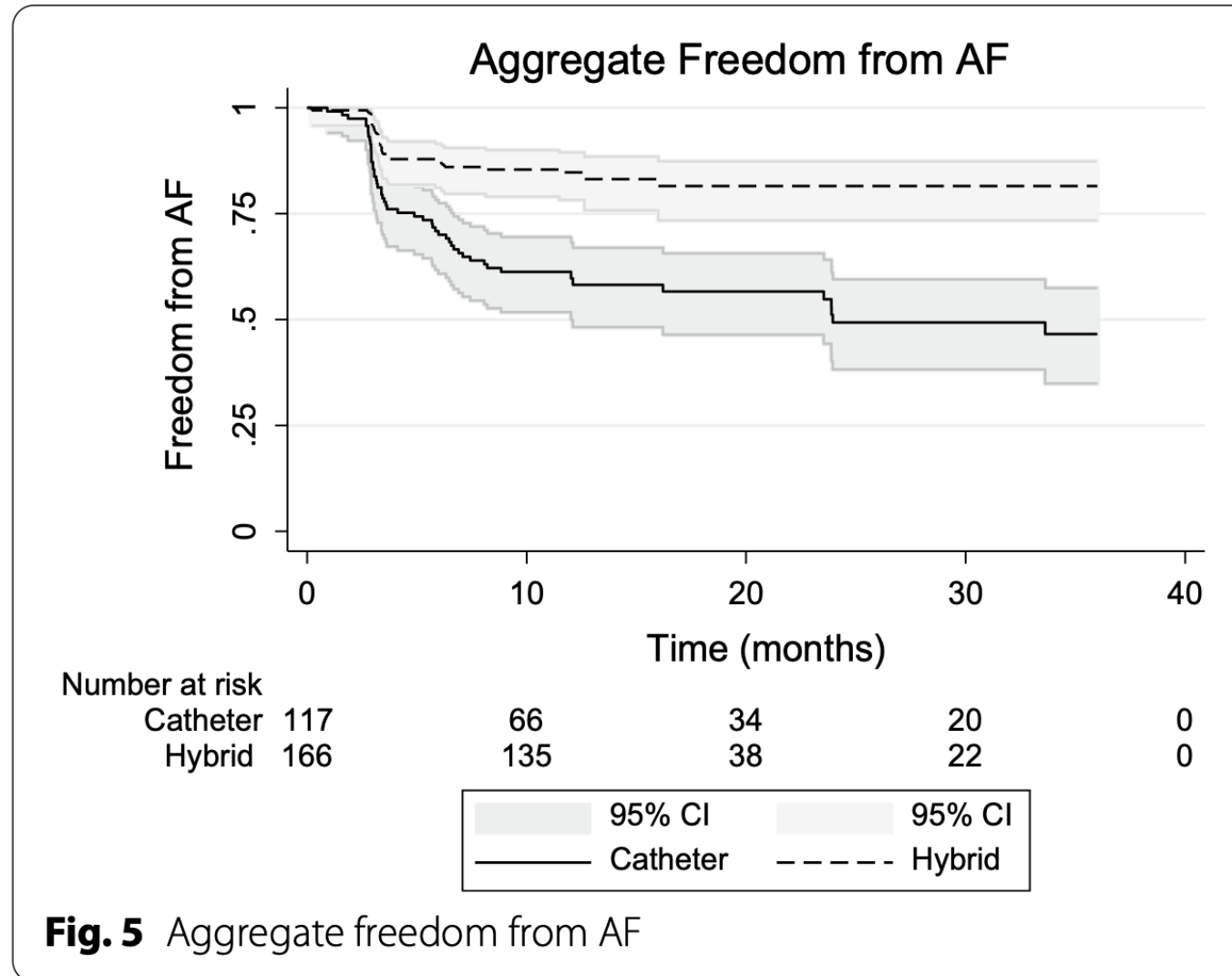


Kaplan-Meier curve depicting recurrence-free survival comparing hybrid with catheter ablation, until 1 year after the index procedure (A) off AAD and (B) allowing AAD. AAD = anti-arrhythmic drug.

TABLE 4 Primary and Secondary Safety Outcomes Including Major and Minor Complications and Total SAEs Until 12 Months of Follow-Up

	HA (n = 19)	CA (n = 22)	P Value
Primary safety: major adverse events and complications			
Bleeding	0	1	—
Cardiac tamponade	0	0	—
Conversion to sternotomy	0	0	—
Diaphragmatic paresis	0	0	—
Empyema	0	0	—
Gastroparesis	0	0	—
Mortality	0	0	—
Myocardial infarction	0	0	—
Pericarditis	1	0	—
Pneumothorax	0	0	—
Stroke	0	0	—
Symptomatic PV stenosis	0	0	—
Total	1 (5)	1 (5)	1.000
Secondary safety			
Minor complications	1	0	—
Vascular access	1	0	—
Pacemaker implantation	0	0	—
Number of SAEs	4 (21)	3 (14)	0.685
Radiation dose (cGycm ²)	31 (8-69)	67 (8-153)	0.004
Total radiation exposure time (hours:min)	00:23 (0-1:59)	1:54 (1:05-2:34)	<0.001

Long persistent and permanent



- Hybrid convergent ablation versus endocardial catheter ablation for atrial fibrillation: a systematic review and meta-analysis of randomised control trials and propensity matched studies - J Cardiothorac Surg. 2022 Aug 13

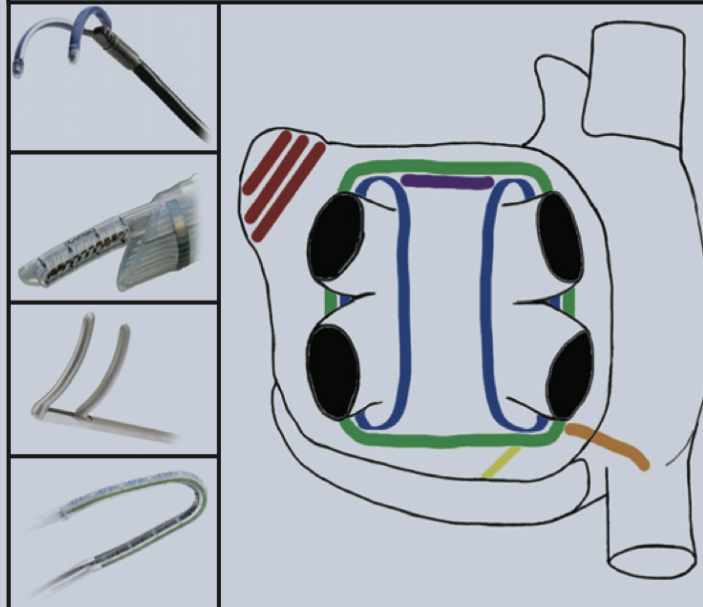
Hybrid Ablation for Atrial Fibrillation: A systematic Review and Meta-Analysis

A meta-analysis was performed to determine the efficacy of Hybrid Ablation procedures for atrial fibrillation at achieving sinus rhythm maintenance



Methods:
Data was collated from:

- 22 Studies
- 925 Patients with predominant long-standing atrial fibrillation
- 19 month mean follow-up



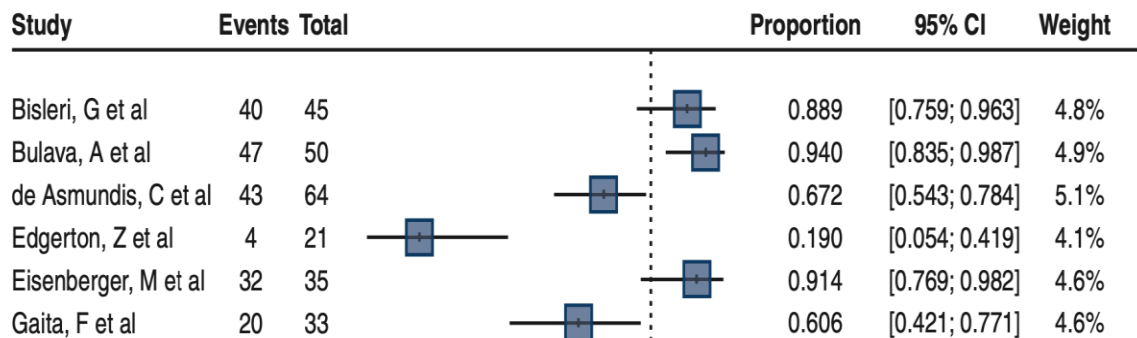
Results:
Overall Sinus Rhythm Maintenance:

- **79.4%** with anti-arrhythmic drugs
- **70.7%** without anti-arrhythmic drugs

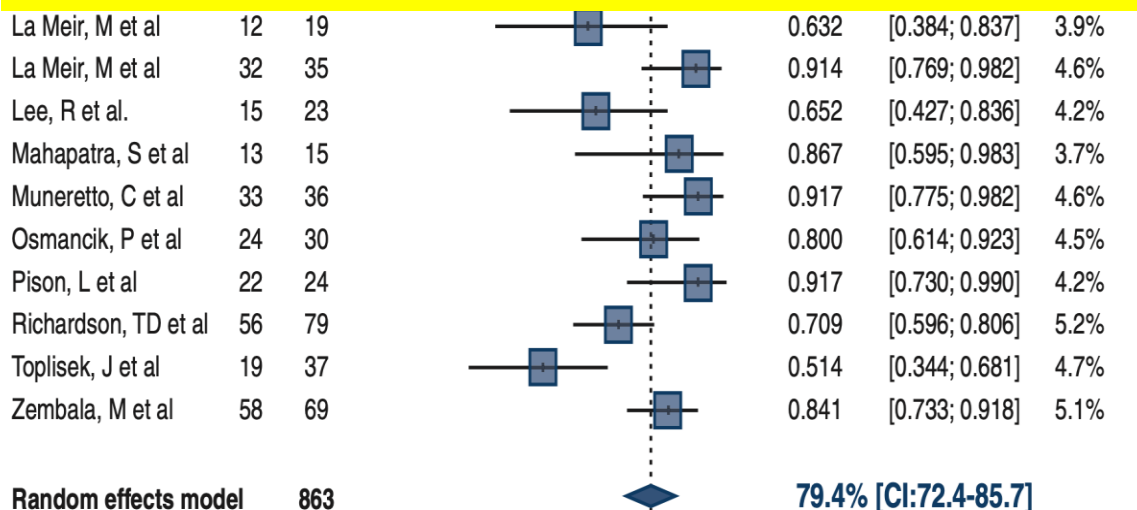
Implications:
The literature suggests favourable rhythm outcomes with Hybrid Ablation of Atrial Fibrillation



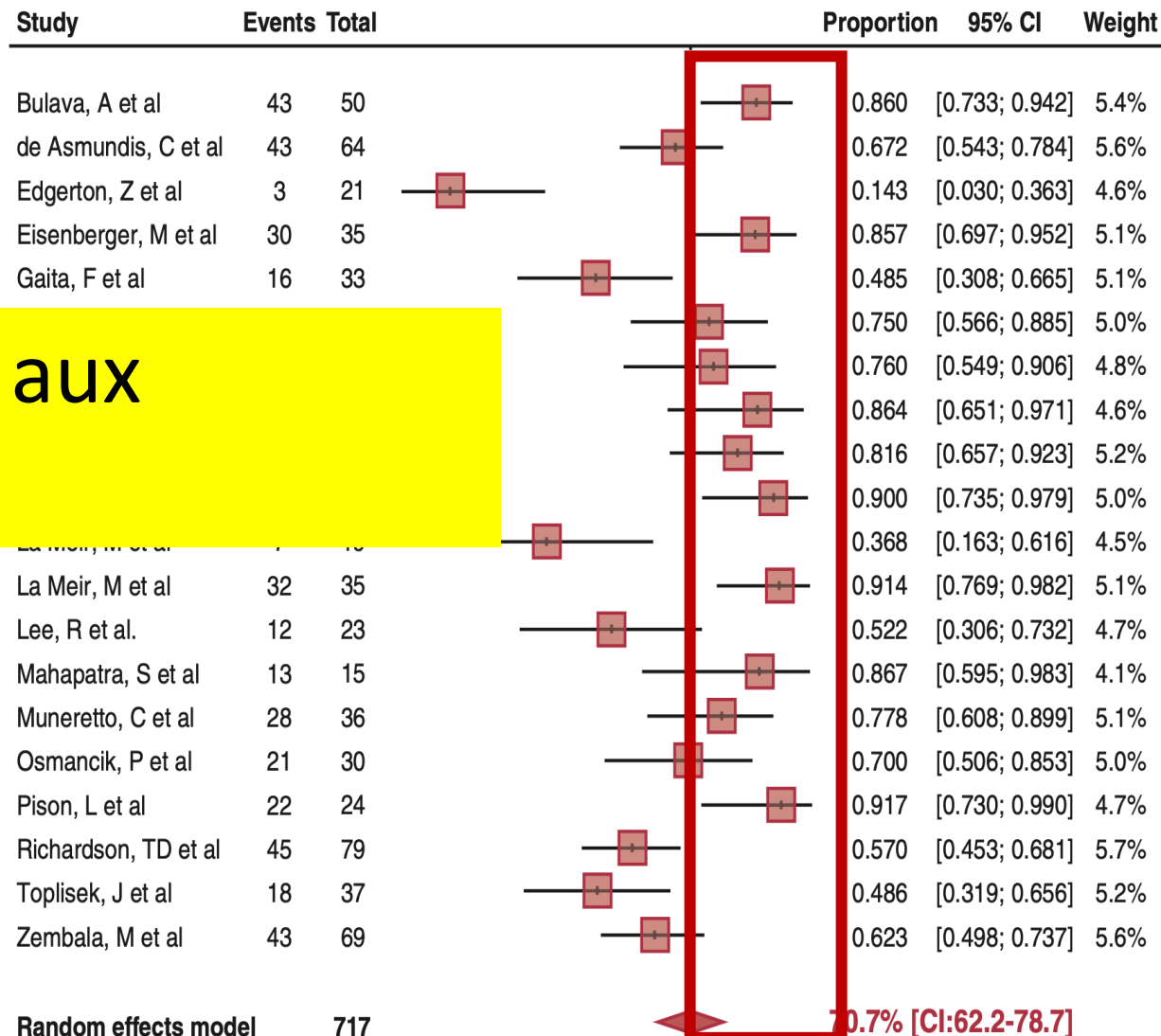
Sinus Rhythm Maintenance



Point commun entre les études aux meilleurs résultats ?

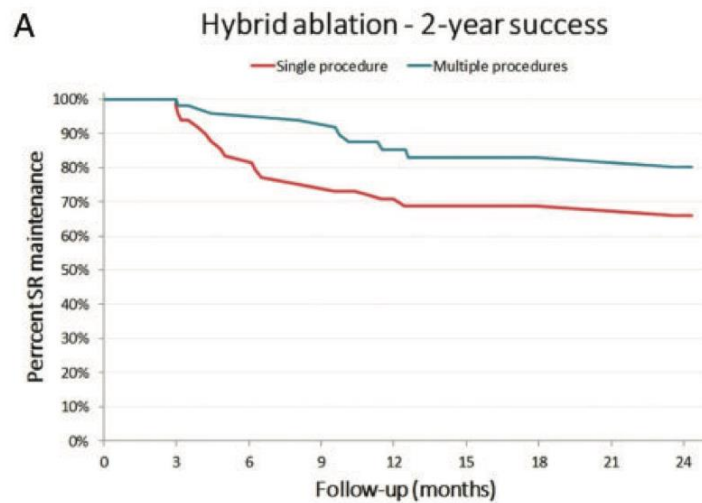


Sinus Rhythm Maintenance without AAD



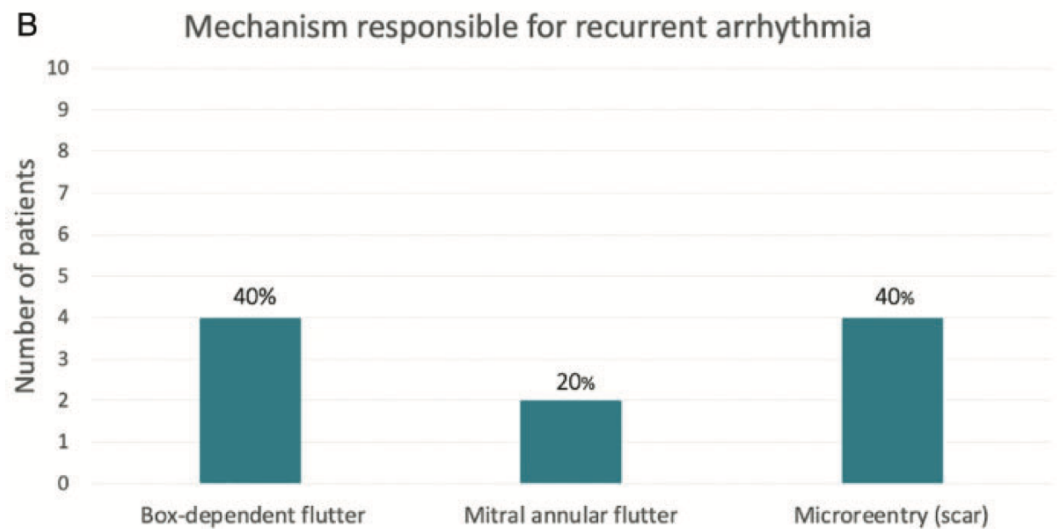
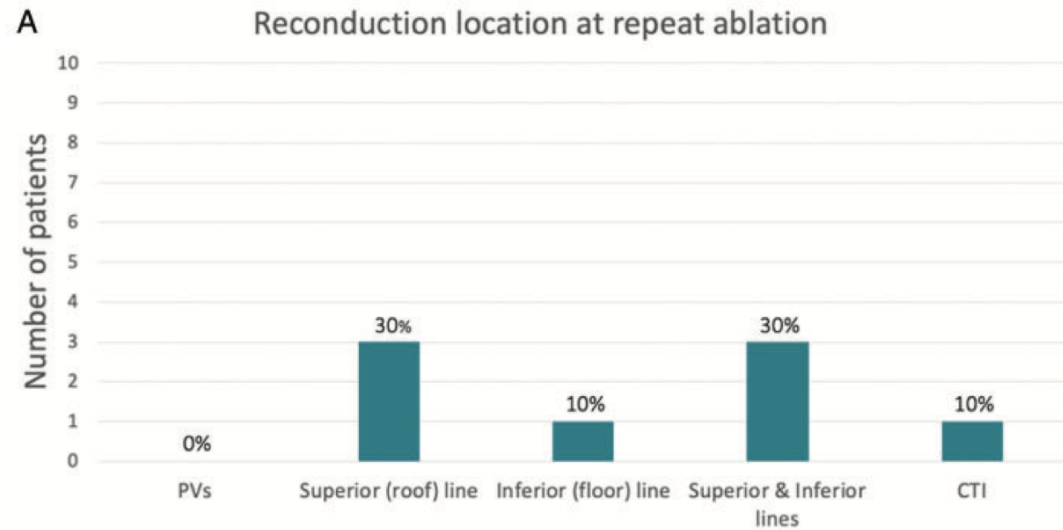
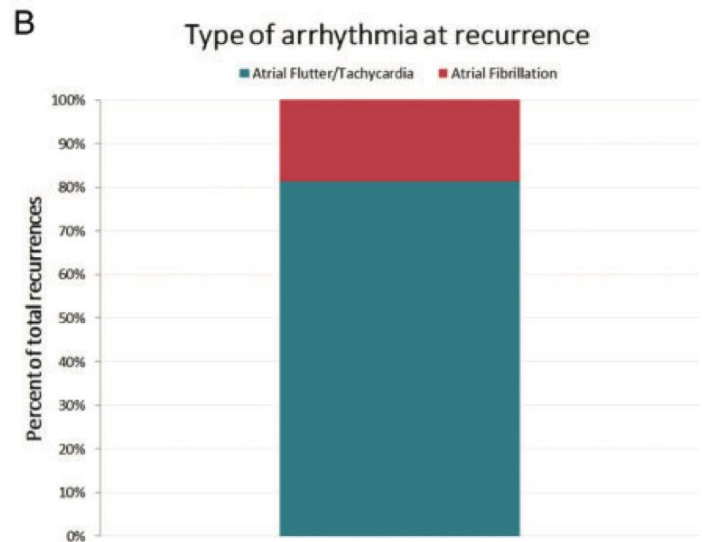
Point commun entre les études aux meilleurs résultats ?

- Système Atricure
- Box postérieure
- Fermeture de l'auricule
- Procédure en temps => fait apparaitre les gaps/attention au bloc transitoire
- Alcoolisation veine de Marshall
- Vérification des lignes/des veines par carte de haute densité en plus de la stimulation !!!!



Patients at risk

	0	3	6	9	12	15	18	21	24
Single procedure	49	39	31	22	22	22	22	22	22
Multiple procedures	49	46	37	26	26	26	26	26	26



First-line treatment of persistent and long-standing persistent atrial fibrillation with single-stage hybrid ablation: a 2-year follow-up study. Europace (2021)

Complications ?

Table 2 Rate of procedural complications

Total complications	12.2% (n = 6)
<hr/>	
Total major complications	4.1% (n = 2)
Bleeding requiring thoracotomy or transfusion	2.0% (n = 1)
Permanent phrenic nerve paralysis	0%
Pacemaker device implantation	2.0% (n = 1)
Stroke	0%
Atrio-oesophageal fistula requiring surgery	0%
Death	0%
Total minor complications	8.2% (n = 4)
Haemoptysis	0%
Pneumonia	4.1% (n = 2)
Transient ischaemic attack	0%
Temporary phrenic nerve paralysis	4.1% (n = 2)

- Fatalement cumul les complications des techniques

- Taux de complication globale de 6,5% dans la méta analyse de Varzaly et al

First-line treatment of persistent and long-standing persistent atrial fibrillation with single-stage hybrid ablation: a 2-year follow-up study. Europace (2021)

Les indications a discuter

- Thrombus intra auriculaire malgré (ou pas) ttt anticoagulant bien suivi
- FA désespérée / désespérante pour l'ep du fait ancienneté, taille og, fibrose IRM? Intérêt de privilégier une approche hybride
- Car même si on commence a bien savoir faire les veines et la ligne mitrale +/- une ligne postérieure, la box postérieure reste un défi (contact œsophage, fibres épiscopardiques)
- Mais l'électroporation va peut être rebattre les cartes....

Conclusions

- Prendre en charge les patients en début de maladie est primordial !!!
- C'est vrai pour beaucoup de maladie, la FA ne fait pas exception

L'intervention hybride

Merci

Dr Thibault VILLEMIN , Reims
Pr Vito Giovanni RUGGIERI, Reims