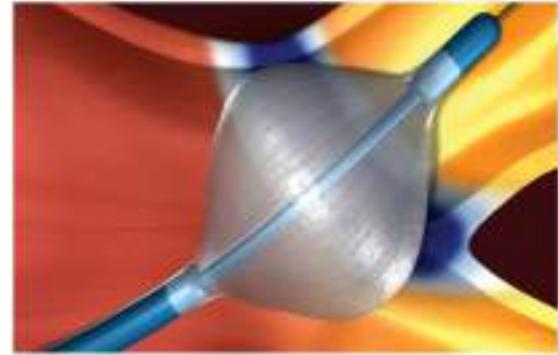


Fibrillation Atriale : Du dépistage au traitement interventionnel Où-en-est-on en 2019?

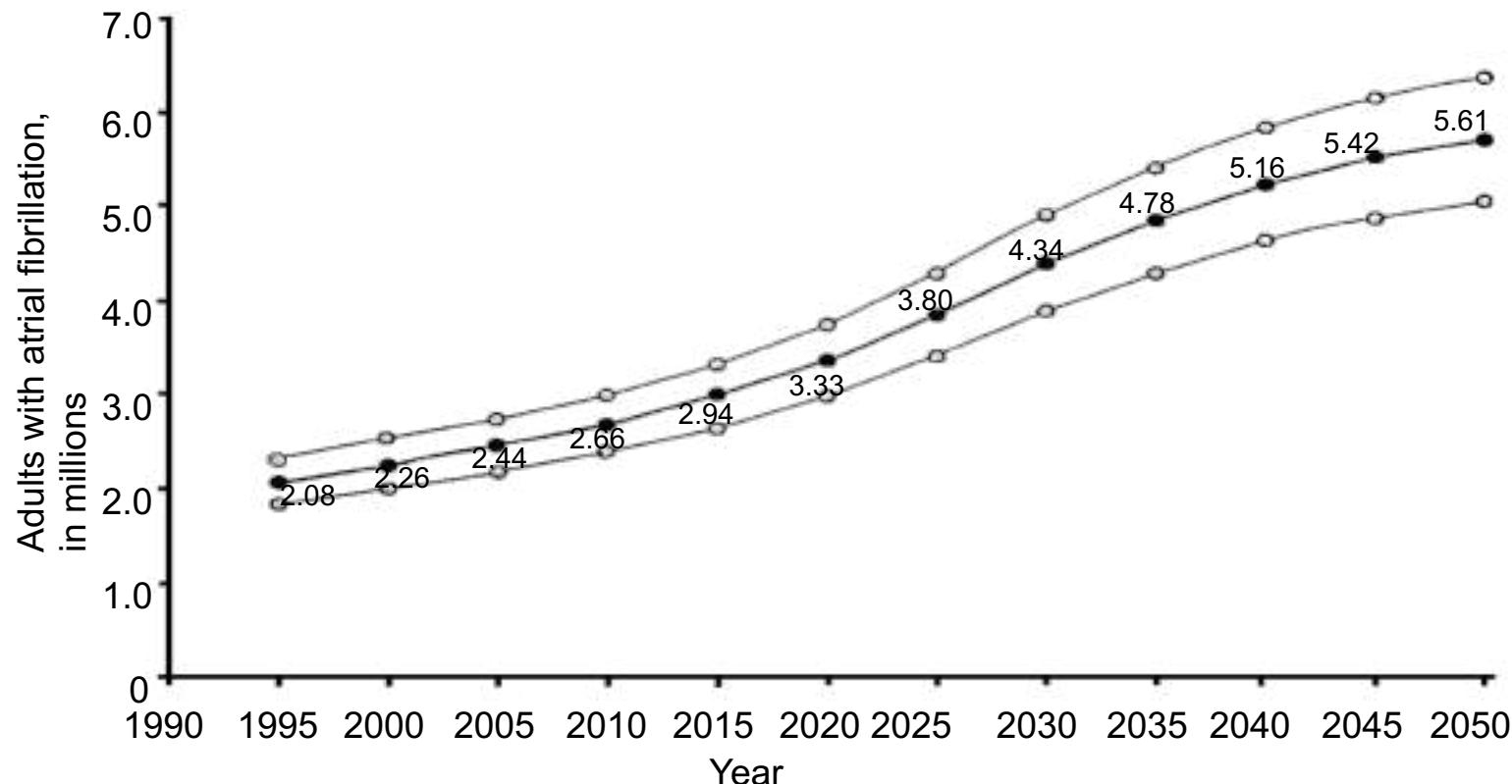


Novembre 2019

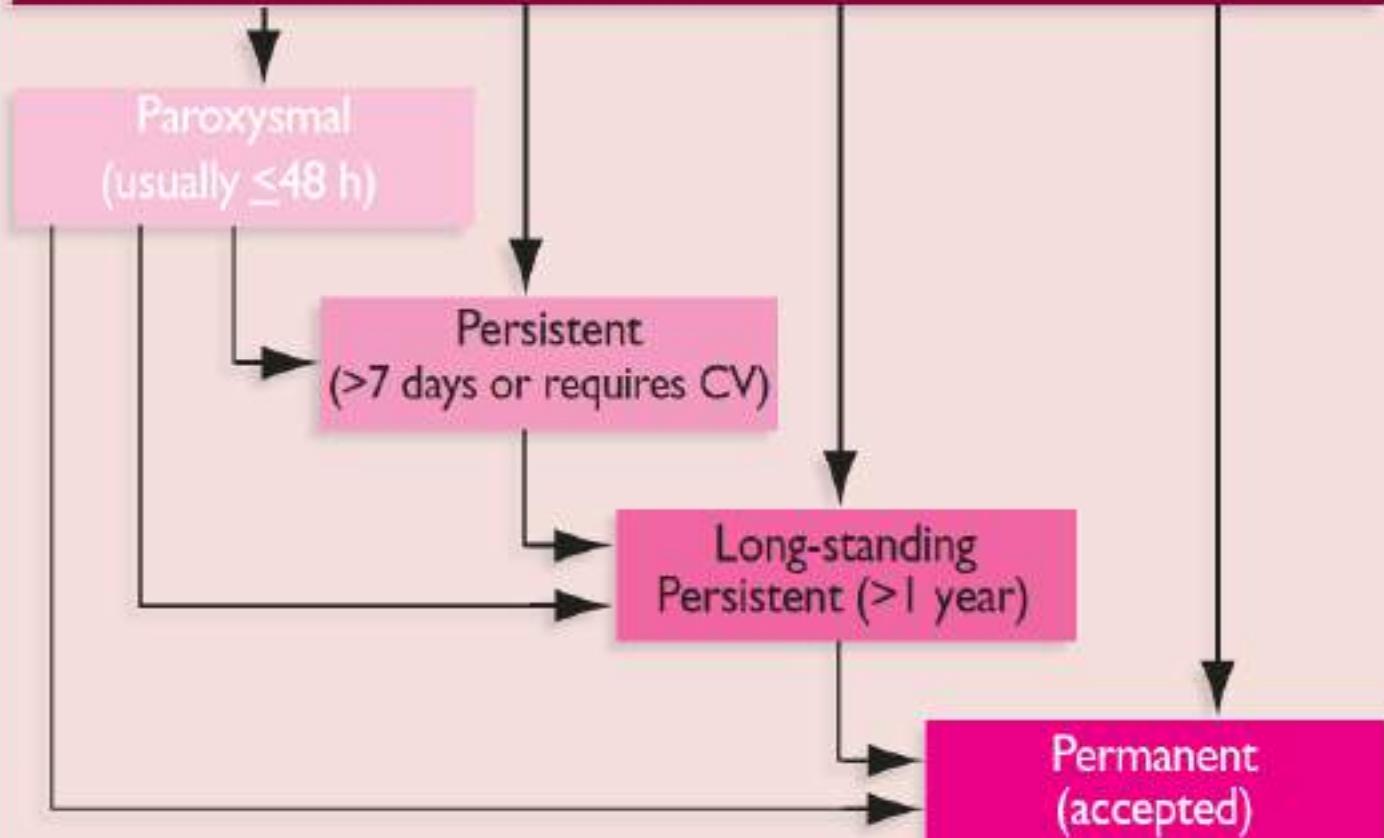
Pascal Defaye,



Perspectives de l'augmentation du nombre de FA



First diagnosed episode of atrial fibrillation



Types and classification of atrial fibrillation**

Atrial Fibrillation Episode	An atrial fibrillation episode is defined as AF that is documented by ECG monitoring and has a duration of at least 30 seconds, or if less than 30 seconds, is present continuously throughout the ECG monitoring tracing. The presence of subsequent episodes of AF requires that sinus rhythm be documented by ECG monitoring between AF episodes.
Paroxysmal AF*	Paroxysmal AF is defined as recurrent AF (≥ 2 episodes) that terminates spontaneously within 7 days. Episodes of AF of ≤ 48 hours' duration that are terminated with electrical or pharmacologic cardioversion should also be classified as paroxysmal AF episodes.
Persistent AF*	Persistent AF is defined as continuous AF that is sustained beyond seven days. Episodes of AF in which a decision is made to electrically or pharmacologically cardiovert the patient after ≥ 48 hours of AF, but prior to 7 days, should also be classified as persistent AF episodes.
Longstanding Persistent AF	Longstanding persistent AF is defined as continuous AF of greater than 12 months' duration.
Permanent AF	The term permanent AF is not appropriate in the context of patients undergoing catheter or surgical ablation of AF, as it refers to a group of patients for which a decision has been made not to restore or maintain sinus rhythm by any means, including catheter or surgical ablation. If a patient previously classified as having permanent AF is to undergo catheter or surgical ablation, the AF should be reclassified.

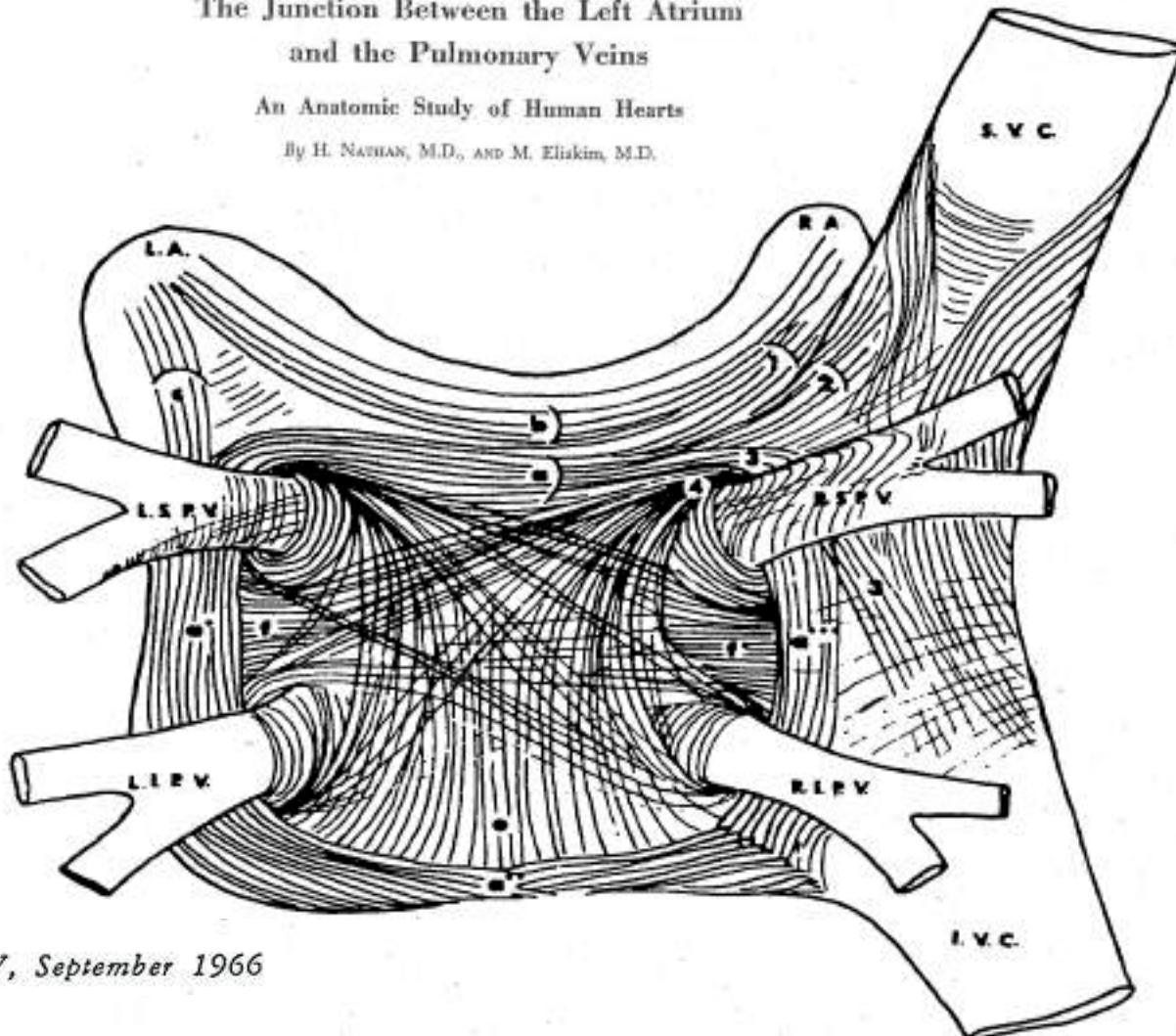
*It is recognized that patients may have both paroxysmal and persistent AF. A patient's AF type should be defined as the most frequent type of AF experienced within six months of an ablation procedure. Continuous AF is AF that is documented to be present on all ECG monitoring performed during a defined period of time.

**We recommend that the term "chronic AF" not be used in the context of patients undergoing ablation of AF as it is ambiguous, and there is no standardized definition of this term.

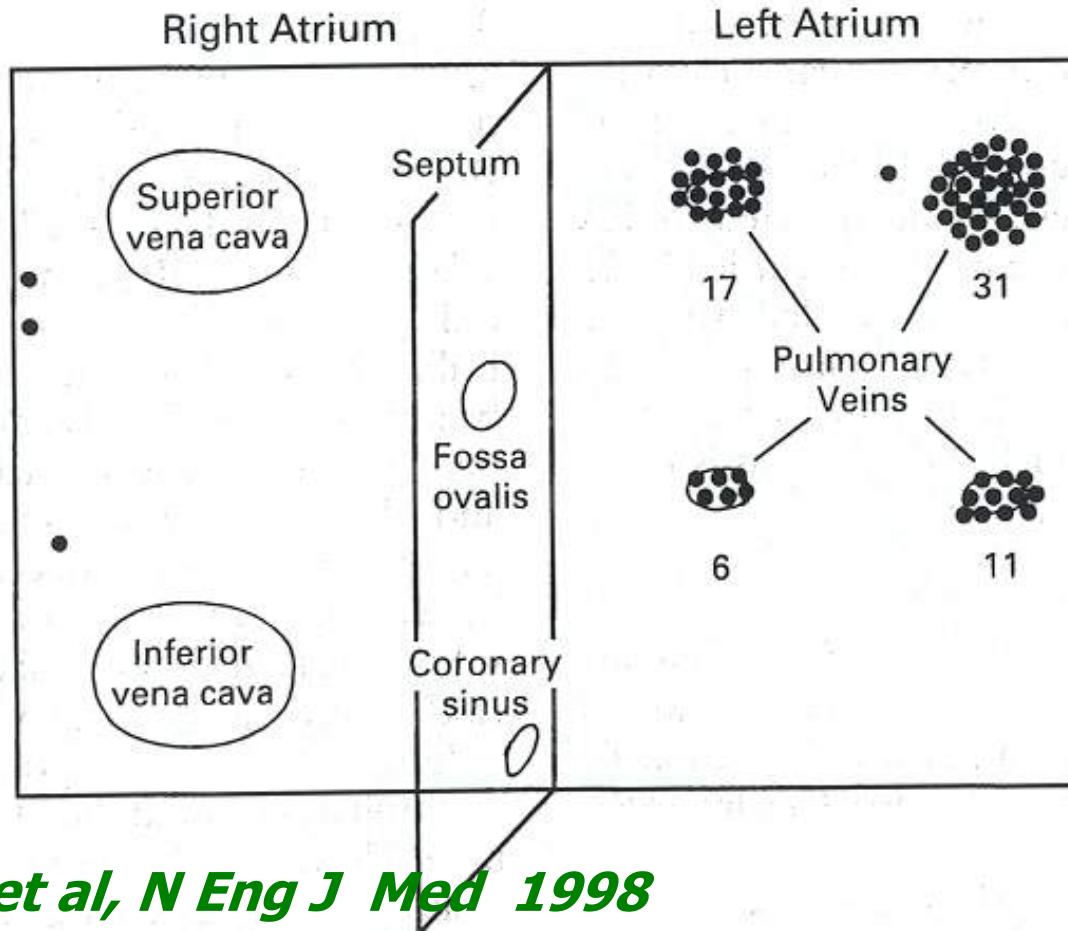
The Junction Between the Left Atrium
and the Pulmonary Veins

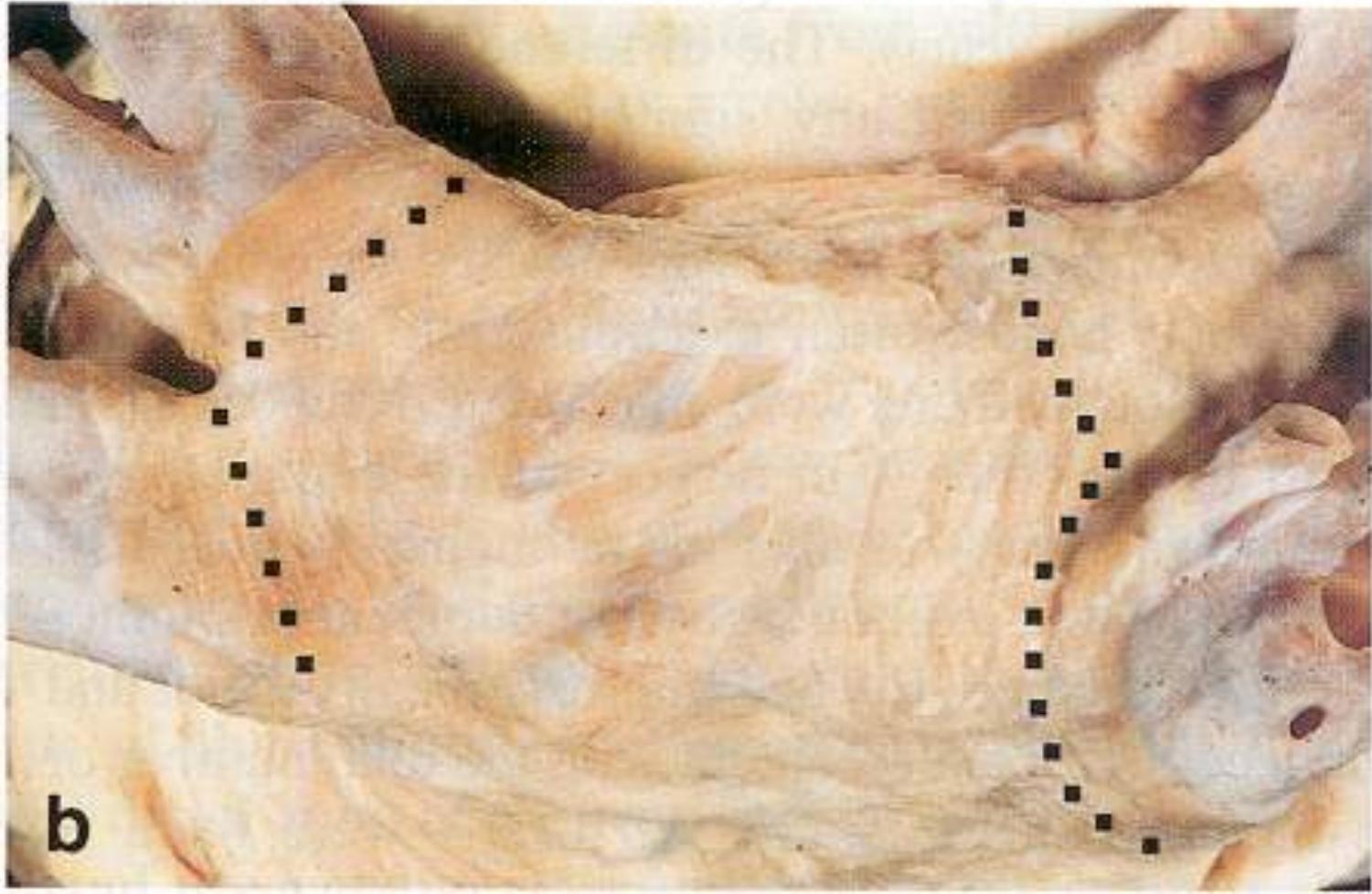
An Anatomic Study of Human Hearts

By H. NATHAN, M.D., AND M. Eliskim, M.D.



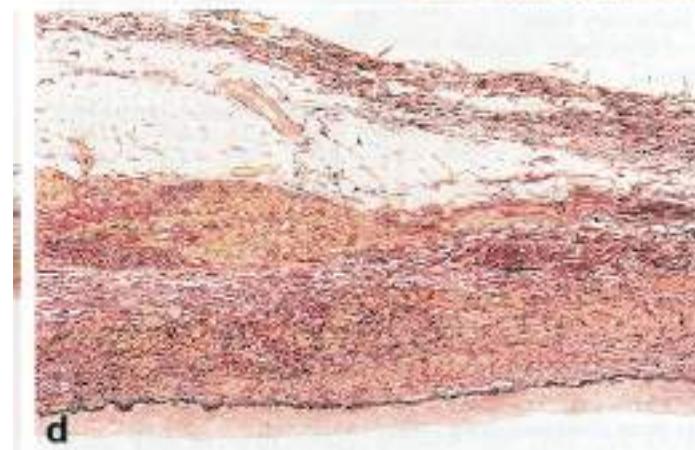
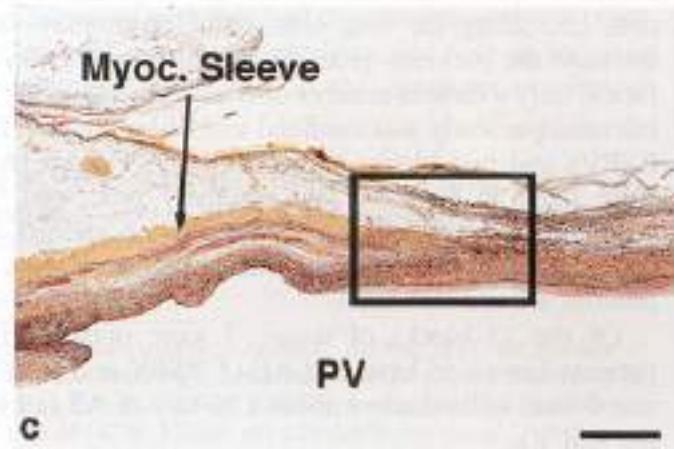
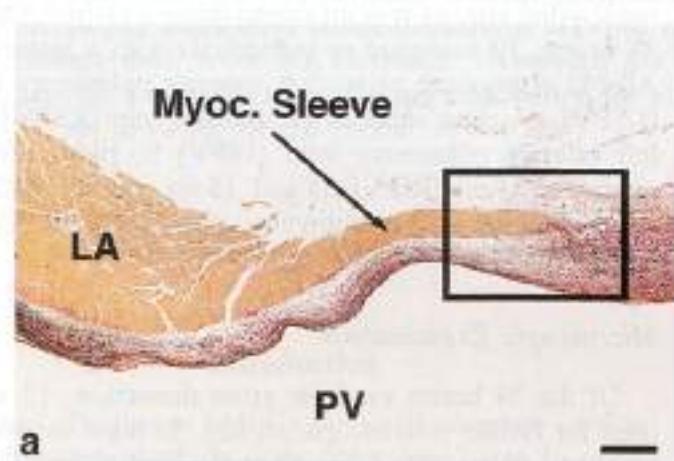
Localisation du foyer arythmogène



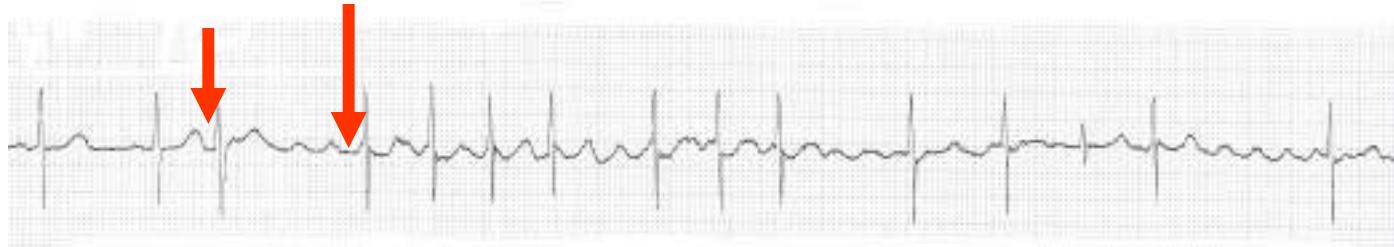


b

***The substrate for atrial fibrillation:
myocardial sleeves extending into the PV***



1



2

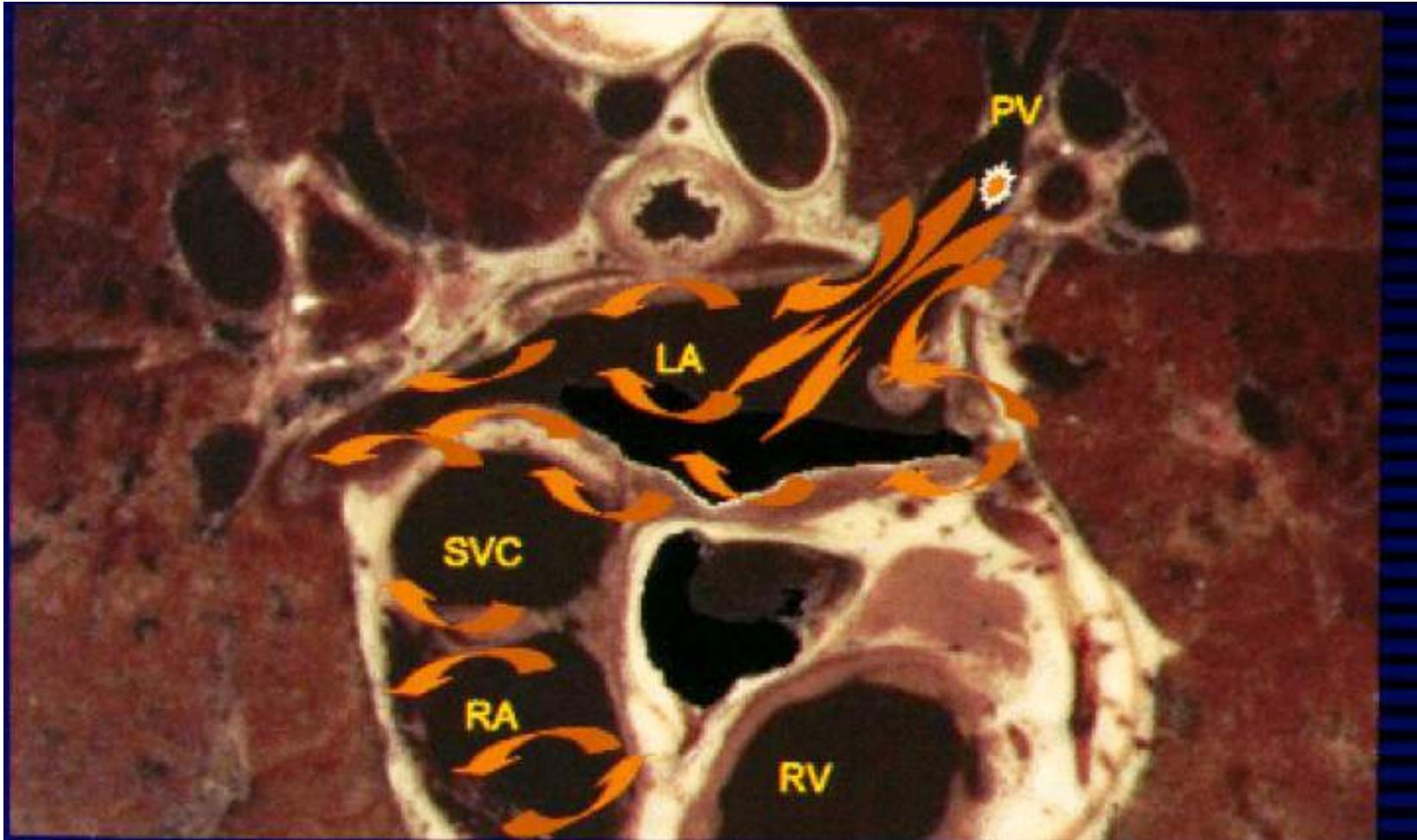


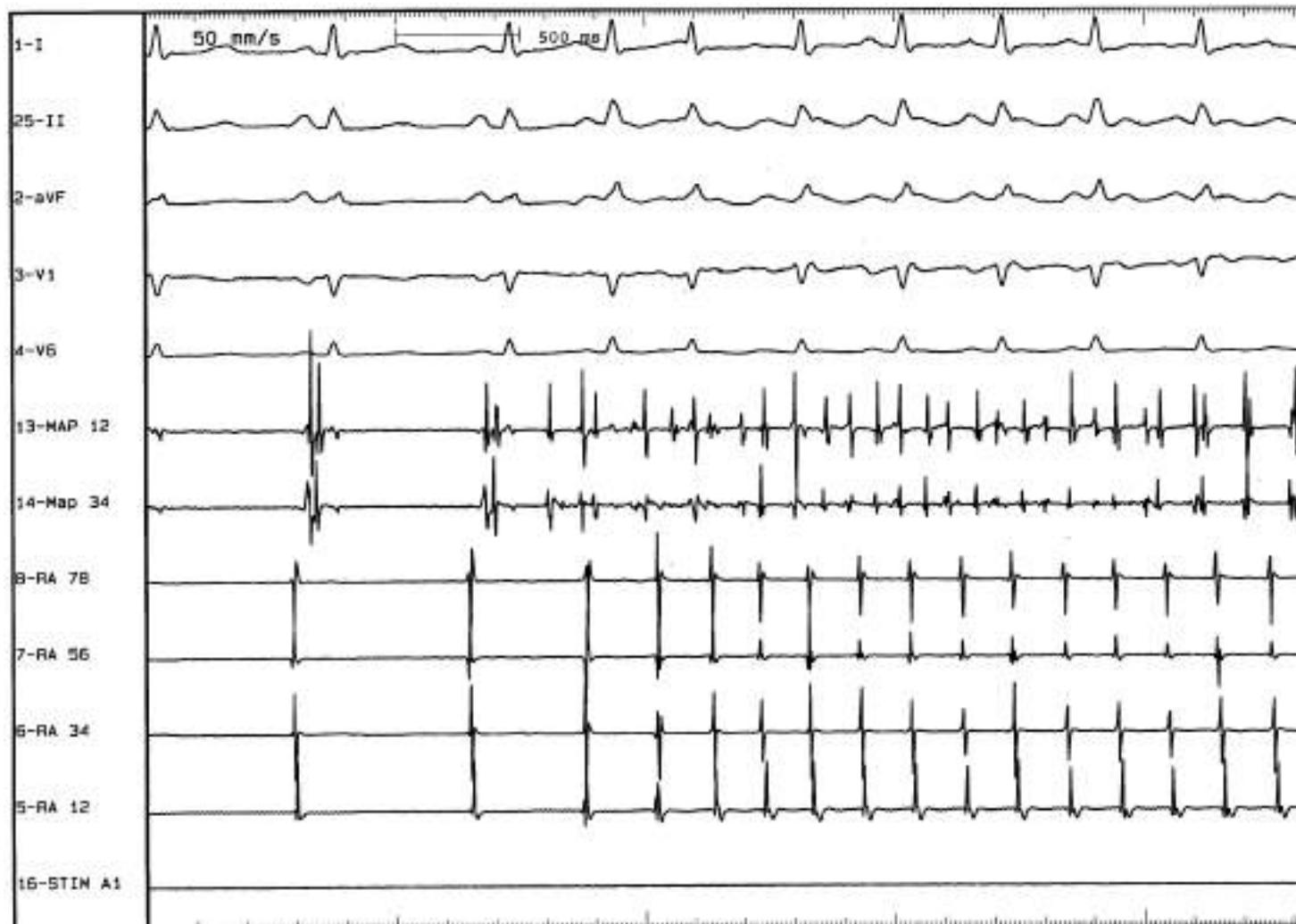
3





Atrial Fibrillation : initiation





The extent of substrate is much wider in persistent AFib

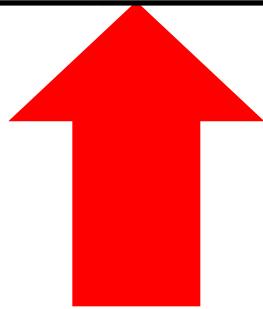
Pulmonary veins

Left atrium

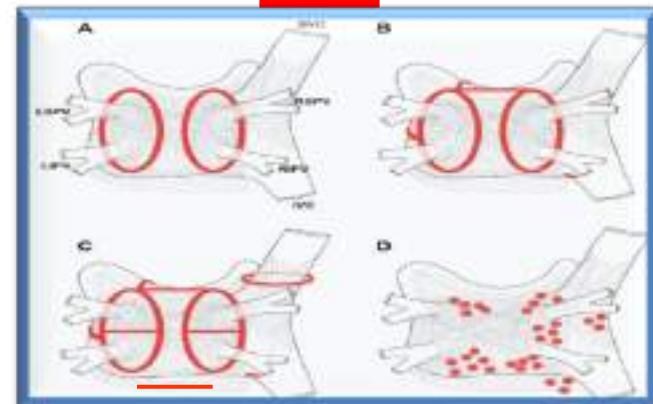
Paroxysmal AF<48h



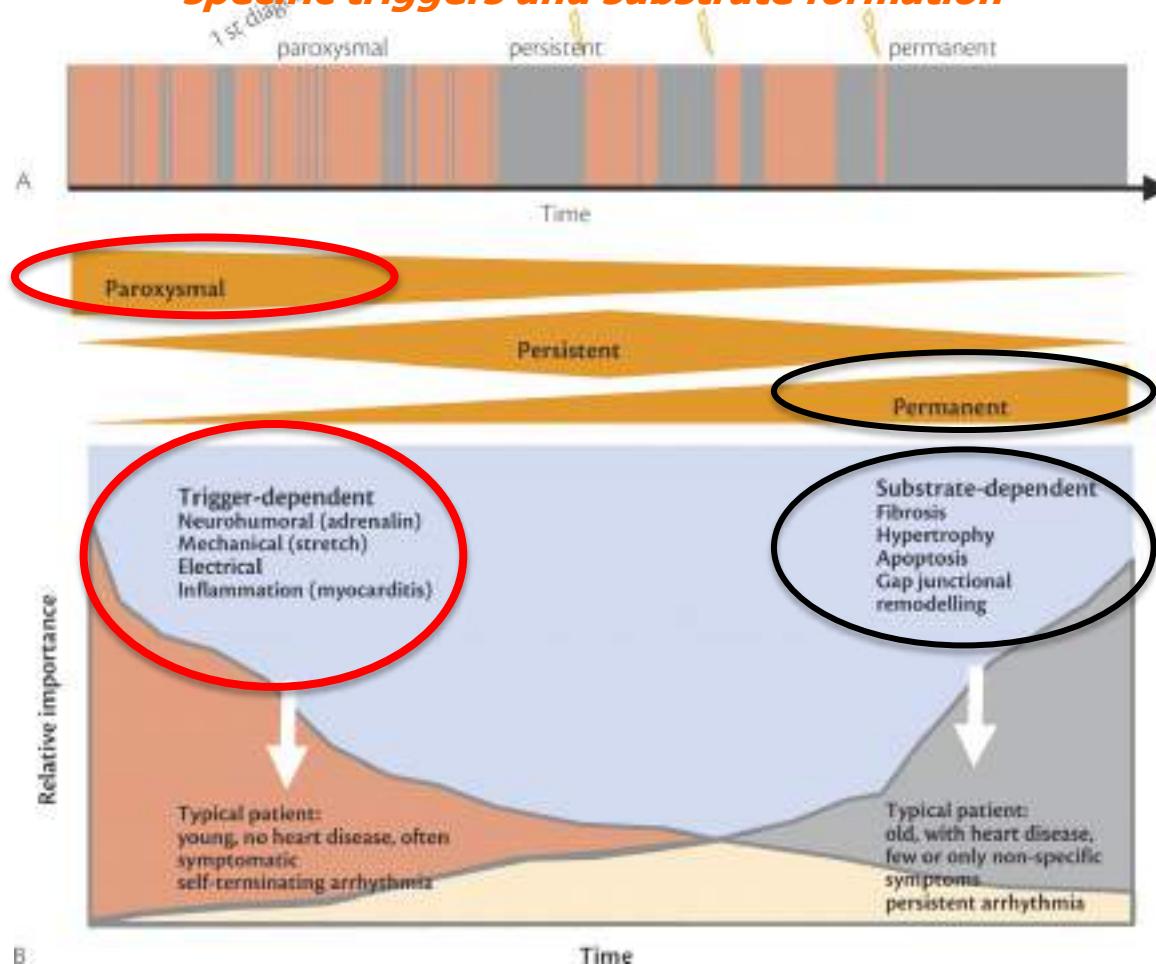
Persistent AF



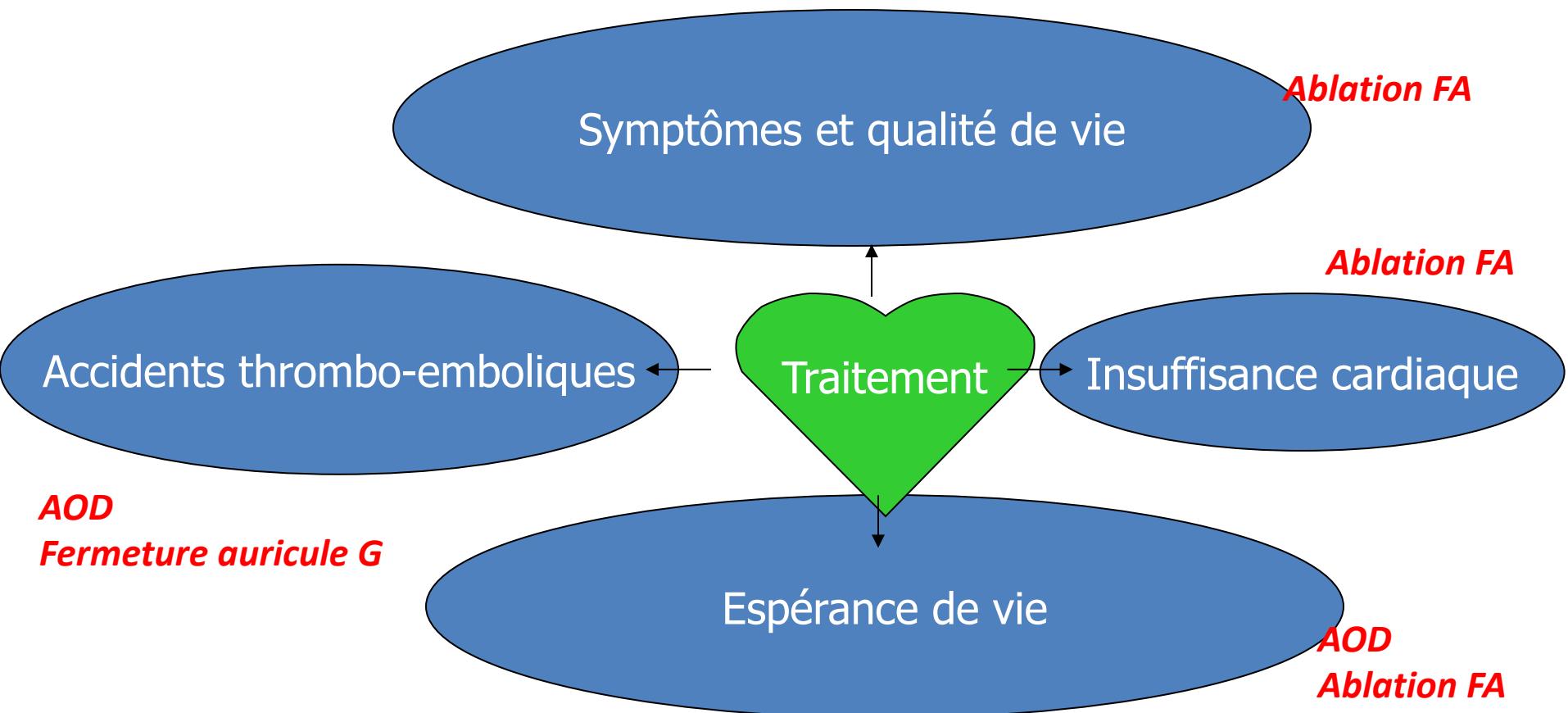
PVI



Progression of atrial fibrillation from paroxysmal to permanent and the importance of specific triggers and substrate formation



Quel est le but du traitement de la FA ?



Why should we care about asymptomatic AF?

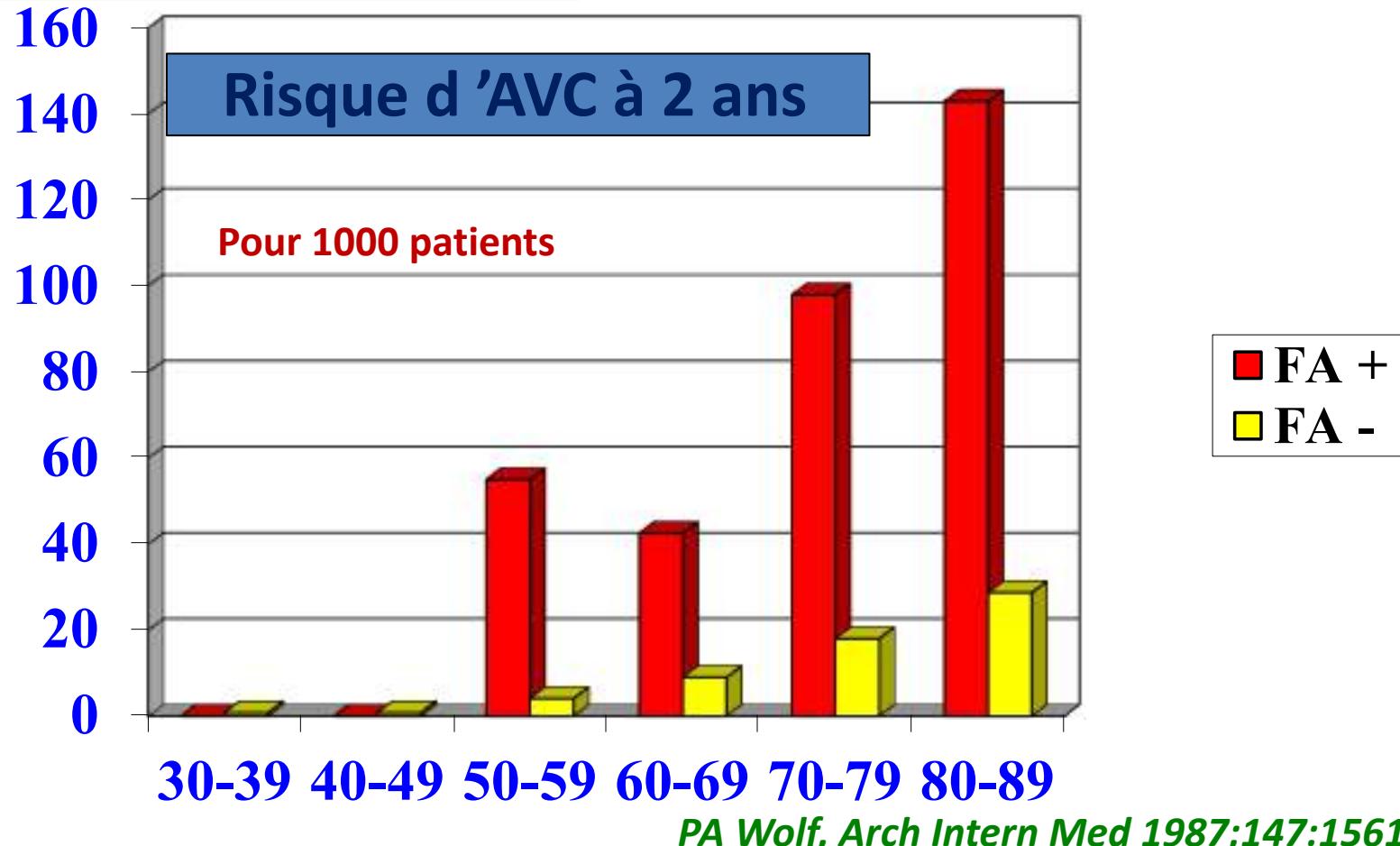


Ischemic strokes
= 85% of strokes

30% of ischemic
strokes = related to AF

25-40% of AF related
strokes = 1st symptom

Atrial Fibrillation: A Major Contributor to Stroke in
the Elderly
The Framingham Study



Screening for atrial fibrillation

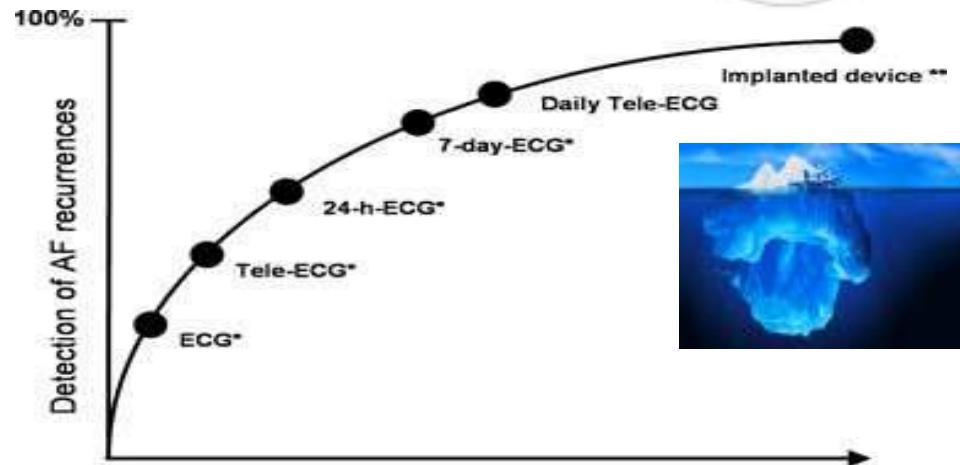
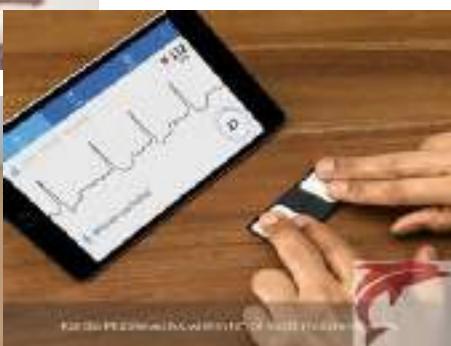
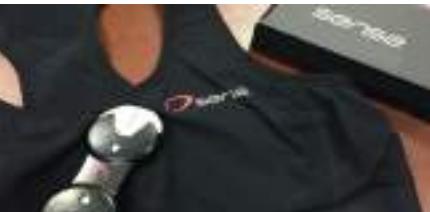
Recommendations	Class	Level
Opportunistic screening for AF is recommended by pulse taking or ECG rhythm strip in patients >65 years of age.	I	B
In patients with TIA or ischaemic stroke, screening for AF is recommended by short-term ECG recording followed by continuous ECG monitoring for at least 72 hours.	I	B
It is recommended to interrogate pacemakers and ICDs on a regular basis for atrial high rate episodes (AHRE). Patients with AHRE should undergo further ECG monitoring to document AF before initiating AF therapy.	I	B
In stroke patients, additional ECG monitoring by long-term non-invasive ECG monitors or implanted loop recorders should be considered to document silent atrial fibrillation.	IIa	B

Nombre à « screener » : 70 pour 1 détection

Après
AVC inexpliqué

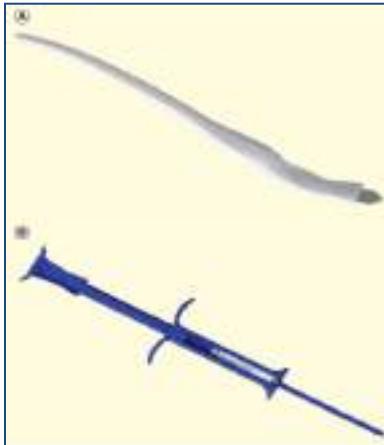
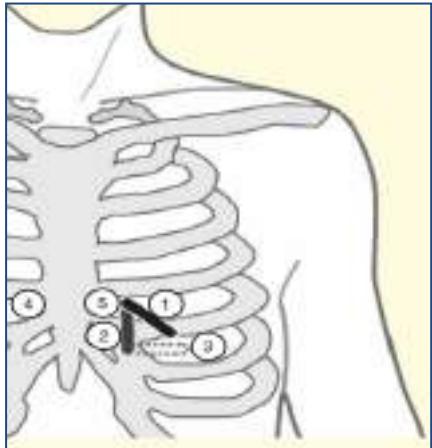
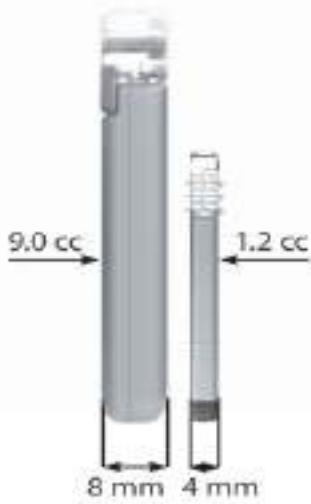
Après
AVC inexpliqué

New Technologies!



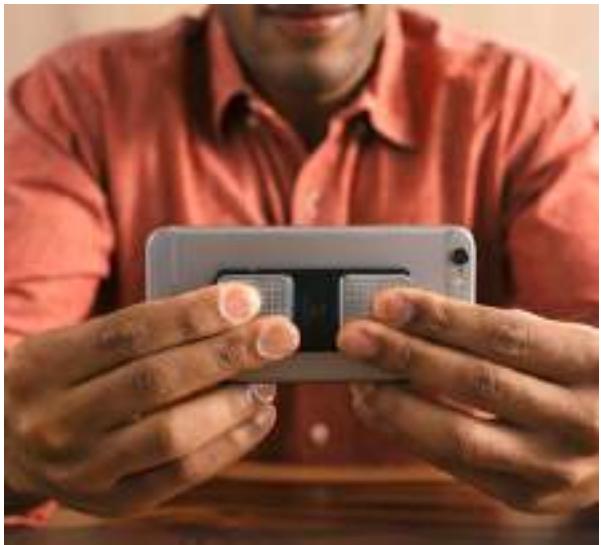
AF burden

ILR : Reveal Link®





Alivecore®



ORIGINAL ARTICLE

N ENGL J MED 381;20 NEJM.ORG NOVEMBER 14, 2019

Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation

Marco V. Perez, M.D., Kenneth W. Mahaffey, M.D., Haley Hedlin, Ph.D.,
John S. Rumsfeld, M.D., Ph.D., Ariadna Garcia, M.S., Todd Ferris, M.D.,
Vidhya Balasubramanian, M.S., Andrea M. Russo, M.D., Amol Rajmane, M.D.,
Lauren Cheung, M.D., Grace Hung, M.S., Justin Lee, M.P.H., Peter Kowey, M.D.,
Nisha Talati, M.B.A., Divya Nag, Santosh E. Gummidipundi, M.S.,
Alexis Beatty, M.D., M.A.S., Mellanie True Hills, B.S., Sumbul Desai, M.D.,
Christopher B. Granger, M.D., Manisha Desai, Ph.D., and
Mintu P. Turakhia, M.D., M.A.S., for the Apple Heart Study Investigators²

Automated
algorithm
Novel Smar



of AF diagnosis compared
electrocardiogram

sensitivity; 84% specificity

93% sensitivity; 83% specificity

Physician Only Oct 20

Recordings labeled as
"unclassified" by the app
algorithm when reviewed
by physician

100%

100% sensitivity; 80% specificity

Assessment of the accuracy of the KB (Kardia Band) smartwatch algorithm for AF detection compared with 12-lead ECG (electrocardiogram) in patients undergoing cardioversion. Automated KB recordings are compared to physician-interpreted 12-lead ECGs and detect AF with 93% sensitivity and 84% specificity. Physician-Interpreted KB recordings are compared to physician-interpreted 12-lead ECGs and detect AF with 99% sensitivity and 83% specificity. Physician-reviewed unclassified automated KB recordings are compared to physician-interpreted 12-lead ECGs and detect AF with 100% sensitivity and 80% specificity. A total of 22 physician-interpreted KB recordings were noninterpretable.



Denis

Date de naissance : 27 nov. 1955 (63 ans)

Enregistré le 24 août 2019 à 20:07

Fibrillation auriculaire — ❤ Moyenne de
106 BPM

Cet ECG présente des signes de FA.

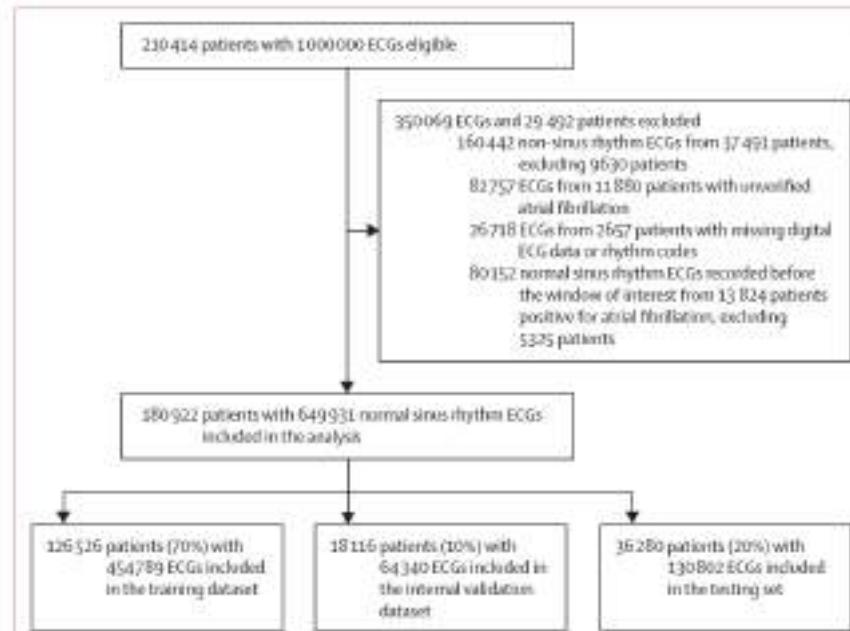
Si ce résultat vous surprend, consultez
votre médecin.



An artificial intelligence-enabled ECG algorithm for the identification of patients with atrial fibrillation during sinus rhythm: a retrospective analysis of outcome prediction

Zach J Alter¹, Peter A Newworth¹, Francisco Lopez-Jimenez², Samuel J Asmar³, Alfonso J Cordero⁴, Raymond J Gami⁵, Robert E Curtis⁶, Xianyu He⁷, Alejandro A Polkstein⁸, Brad J Eikelboom⁹, Sung R Kao¹⁰, Paul A Friedman¹¹

Artificial intelligence (AI)-enabled ECG using a convolutional neural network to detect the electrocardiographic signature of AF present during normal sinus rhythm using standard 10-second, 12-lead ECGs.
A II patients ≥ 18 years with at least one digital, normal sinus rhythm, standard 10-second, 12-lead ECG



An artificial intelligence-enabled ECG algorithm for the identification of patients with atrial fibrillation during sinus rhythm: a retrospective analysis of outcome prediction

Zach I Alter¹, Peter A Newworth¹, Francisco Lopez-Jimenez², Samuel J Asvataram³, Alirezaeh J Goshenoff⁴, Raymond J Carroll⁵, Robert E Curtis⁶, Xianyu He⁷, Alejandro A Polkstein⁸, Brad J Erickson⁹, Sung Kwon¹⁰, Paul A Friedman¹¹

Conclusion : An AI-enabled ECG acquired during normal sinus rhythm permits identification at point of care of individuals with atrial fibrillation

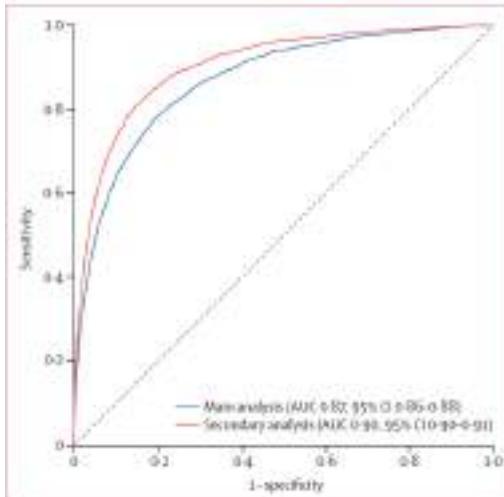


Figure 3: ROC curves for the convolutional neural networks on the testing dataset

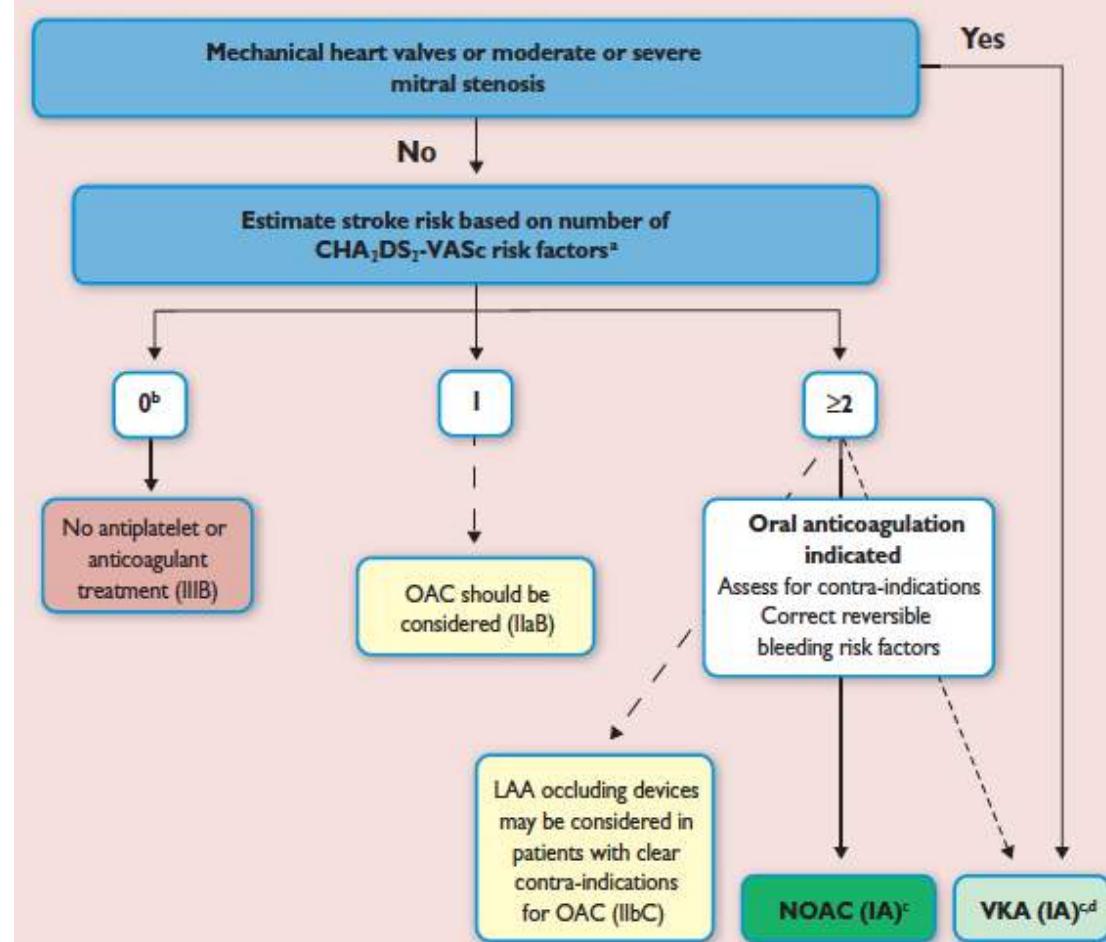
In the main analysis, only the score of the first normal sinus rhythm ECG in the window of interest was used. In the secondary analysis, the highest score for all ECGs done in the first month of the window of interest was used. ROC=receiver operating characteristic; AUC=area under the curve; ECG=electrocardiograph.

	AUC	Sensitivity	Specificity	F1 score	Accuracy
Main analysis	0.87 (0.86-0.88)	79.0% (77.5-80.4)	79.5% (79.0-79.9)	39.2% (38.1-40.3)	79.4% (79.0-79.9)
Secondary analysis	0.90 (0.90-0.91)	82.3% (80.9-83.6)	83.4% (83.0-83.8)	45.4% (44.2-46.5)	83.3% (83.0-83.7)

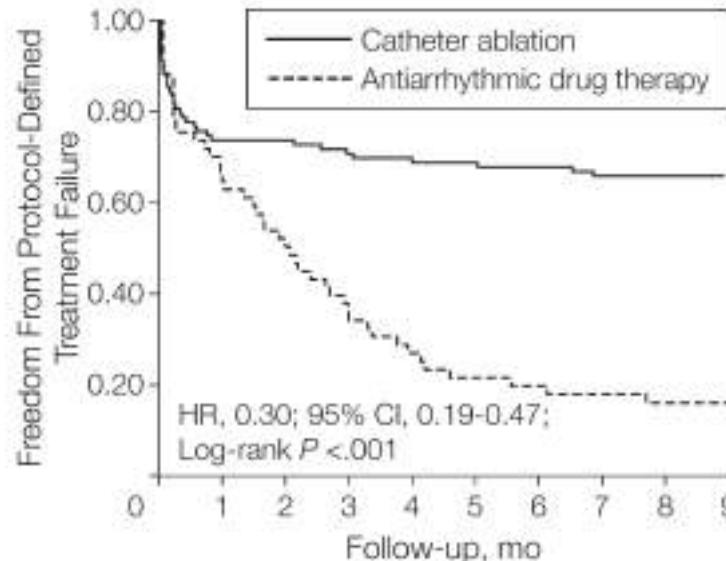
Data in parentheses are 95% CIs. In the main analysis, only the score of the first normal sinus rhythm ECG in the window of interest was used. In the secondary analysis, the highest score for all ECGs done in the first month of the window of interest was used. AUC=area under the curve. ECG=electrocardiograph.

Table: Model performance

CHA ₂ DS ₂ -VASc risk factor	Points
Congestive heart failure Signs/symptoms of heart failure or objective evidence of reduced left-ventricular ejection fraction	+1
Hypertension Resting blood pressure >140/90 mmHg on at least two occasions or current antihypertensive treatment	+1
Age 75 years or older	+2
Diabetes mellitus Fasting glucose >125 mg/dL (7 mmol/L) or treatment with oral hypoglycaemic agent and/or insulin	+1
Previous stroke, transient ischaemic attack, or thromboembolism	+2
Vascular disease Previous myocardial infarction, peripheral artery disease, or aortic plaque	+1
Age 65–74 years	+1
Sex category (female)	+1



**Comparison of Antiarrhythmic Drug Therapy
and Radiofrequency Catheter Ablation
in Patients With Paroxysmal Atrial Fibrillation**
A Randomized Controlled Trial



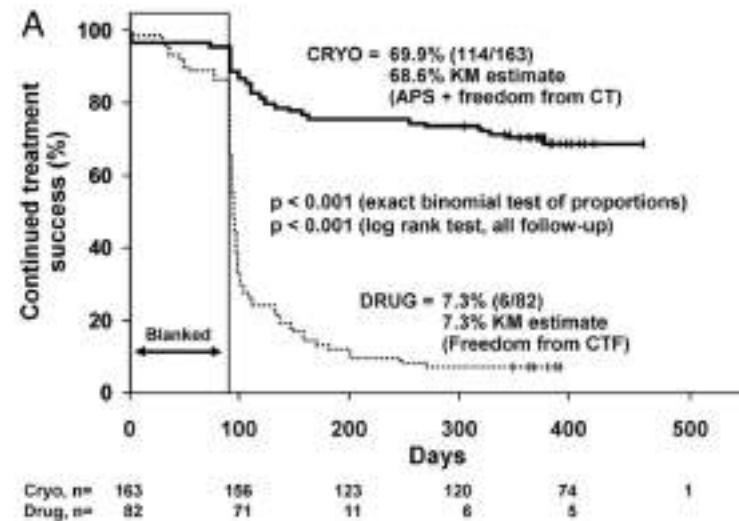
No. at risk	106	75	75	72	70	70	69	67	65	51
Catheter ablation	106	75	75	72	70	70	69	67	65	51
Antiarrhythmic drug therapy	61	36	28	20	15	12	11	10	7	3

JAMA. 2010;303(4):333-340

**Cryoballoon Ablation of Pulmonary Veins
for Paroxysmal Atrial Fibrillation**

Fist Results of the North American
Atrial Fibrillation (STOP AF) Pivotal Trial

Douglas L. Packer, MD,¹ Robert C. Kowal, MD,¹ Kevin R. Wheeler, MD,¹ James M. Irvin, MD,¹
Joel Chapman, MD,² Paul G. Garratt, MD,² Marc Dubois, MD,³ Vicki Roehr, MD,⁴
Linda Nelson, RN,⁵ Richard C. Holbrook, PhD,⁶ John W. Labarthe, MD, MPH,^{7,8}
Jonny N. Rostein, MD,⁹ for the STOP AF Collaboration Investigators



J Am Coll Cardiol 2013;61:1713-23

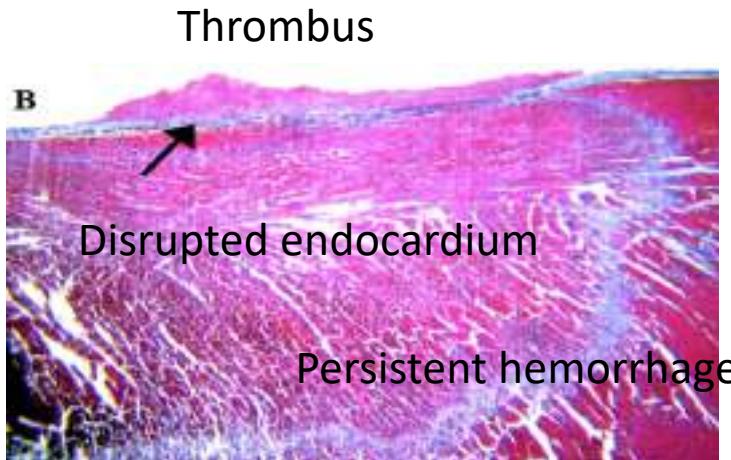
What is the ideal ablation technology for AF ablation

- Safe
- Rapid PV isolation
- Persistent PVI with 1 procedure
- Little need to fluoroscopy
- No need for additional mapping

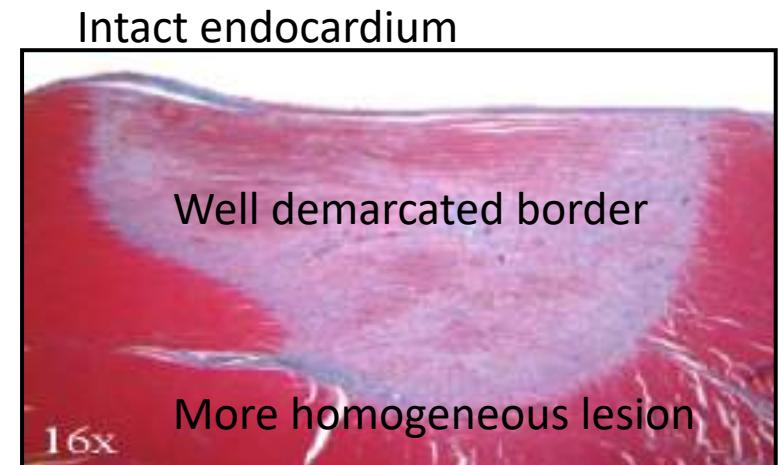
Is cryoballoon technology the answer?

Cryoablation is > to RF ablation +++

- **RF ablation : limitations**
 - Rapid edema formation
 - Collateral damage
 - Technically difficult



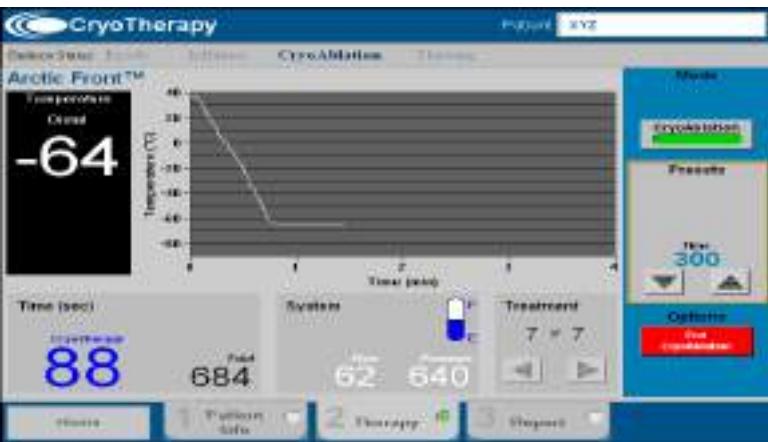
- **Cryoballoon ablation : benefits**
 - Single circumferential lesion
 - Potentially reduced risk of complications



Clinical practice (University Hospital/ Grenoble France)



- Cryoballoon since 2007 for all paroxysmal AF ablation (3000 procedures)
- Antral PV isolation with 4 mn once per vein
- Size of the balloon : 100%: 28 mm



CT scan before to be aware of challenging anatomy





Cryoballoon ablation procedure

1: Access targeted vein



2: Inflate and position



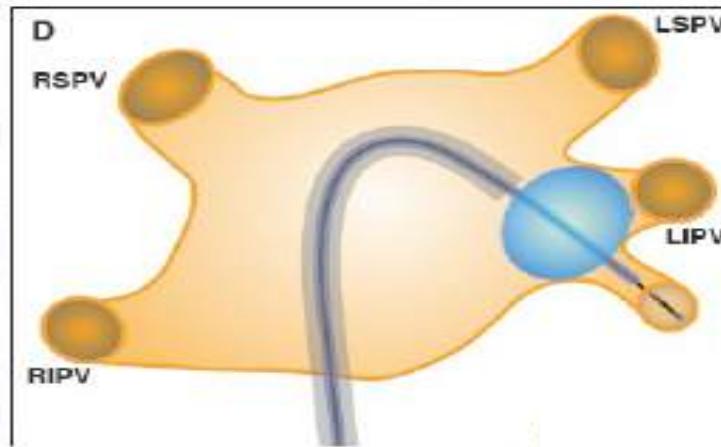
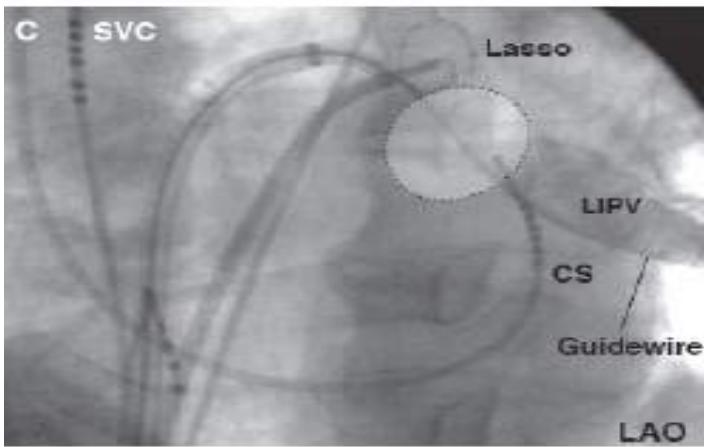
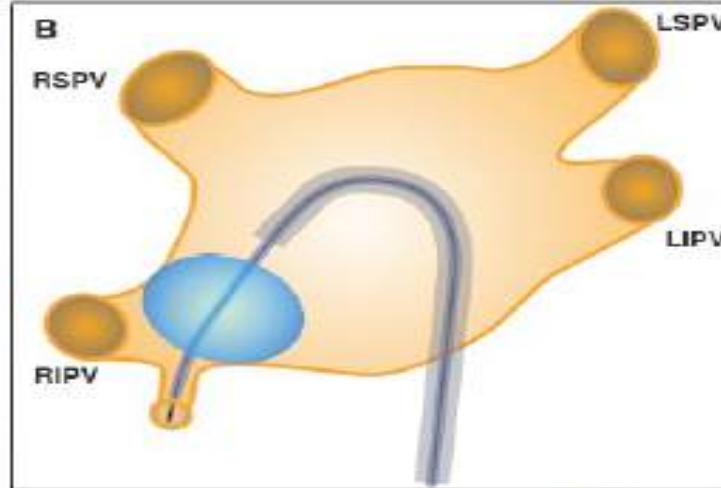
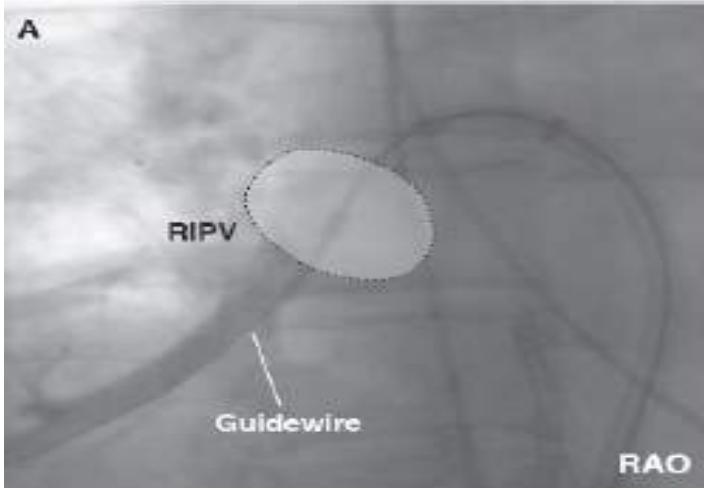
3: Occlude and ablate



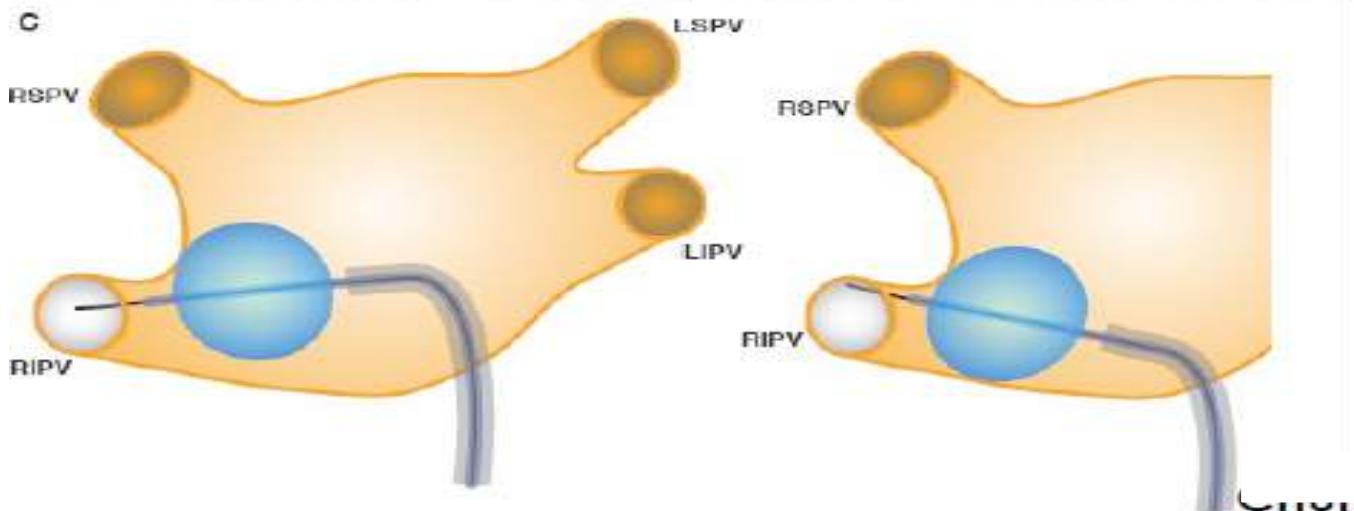
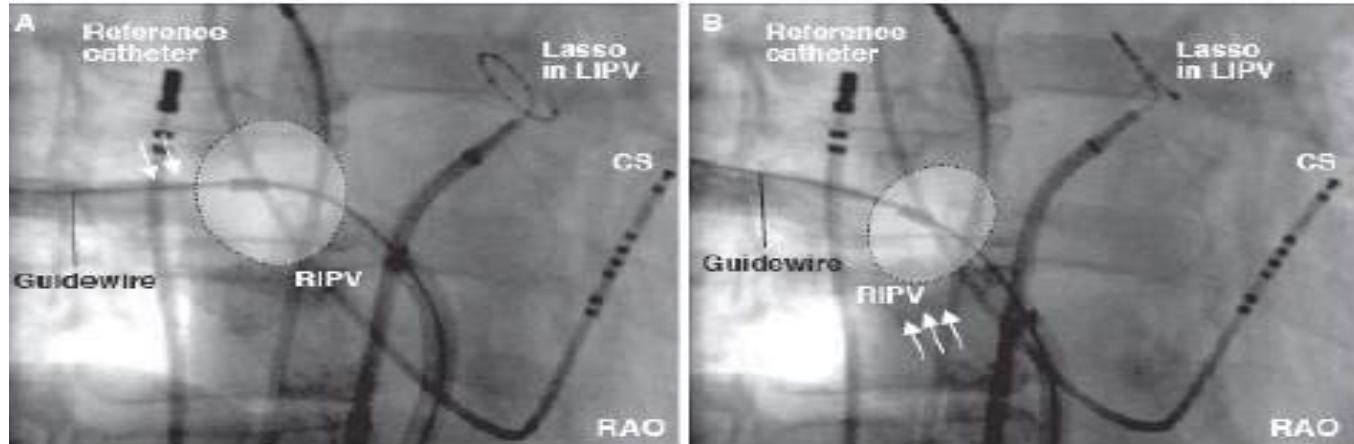
4: Assess PVI

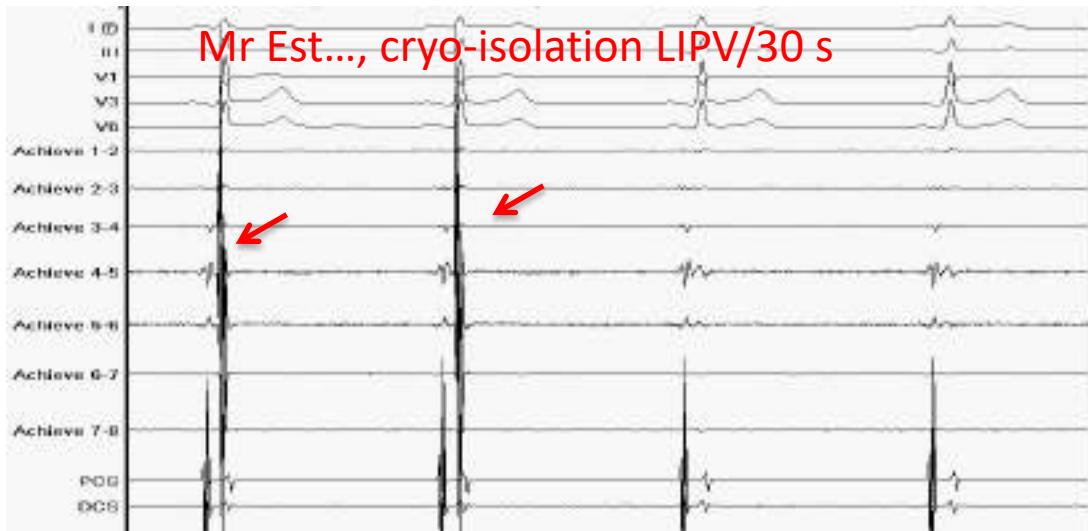
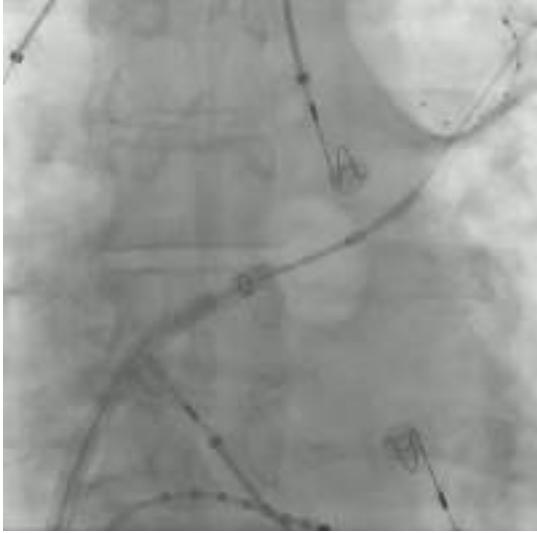
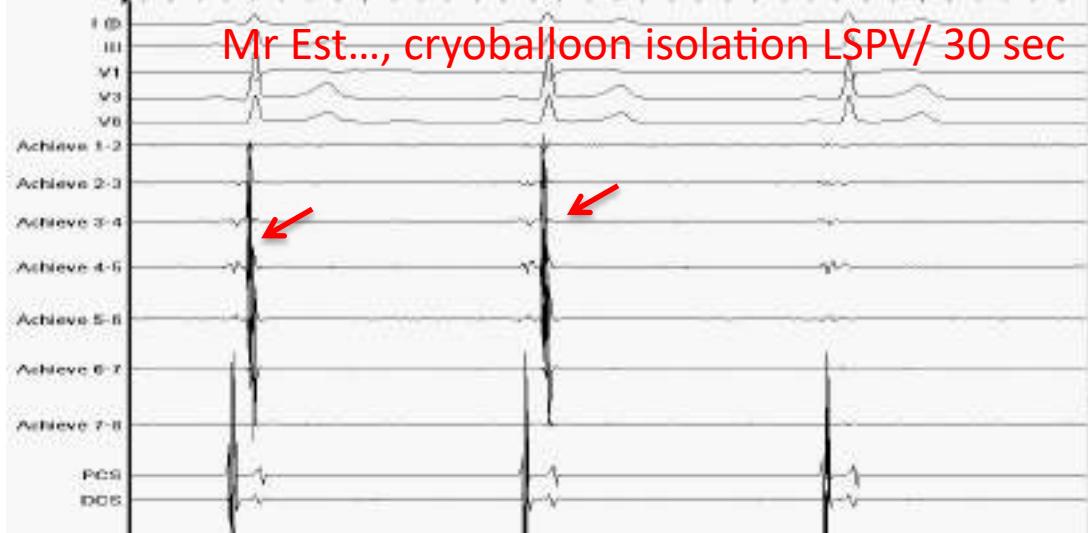


Hockey Stick Technique

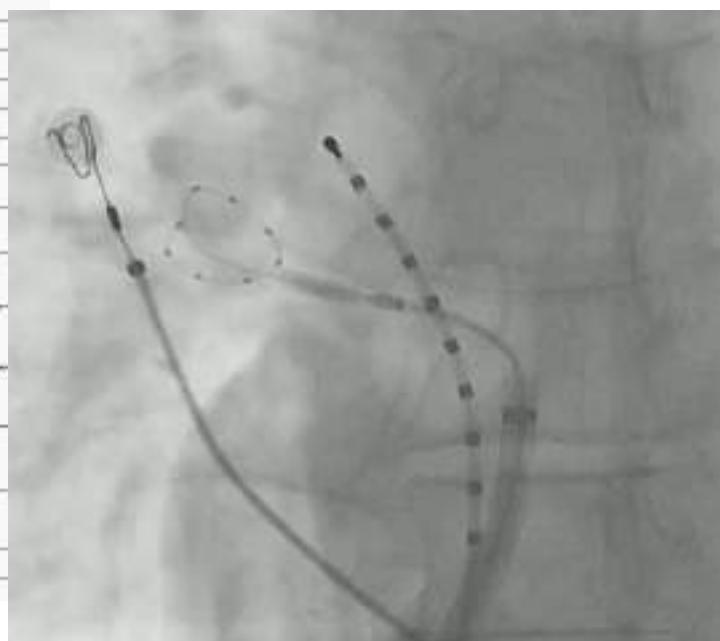
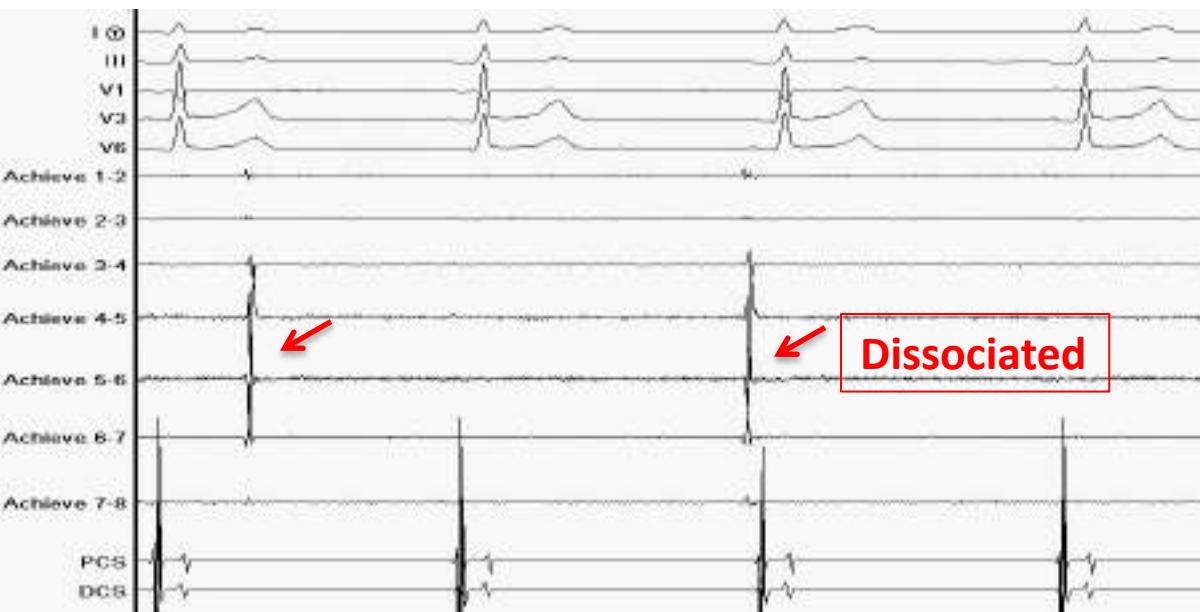


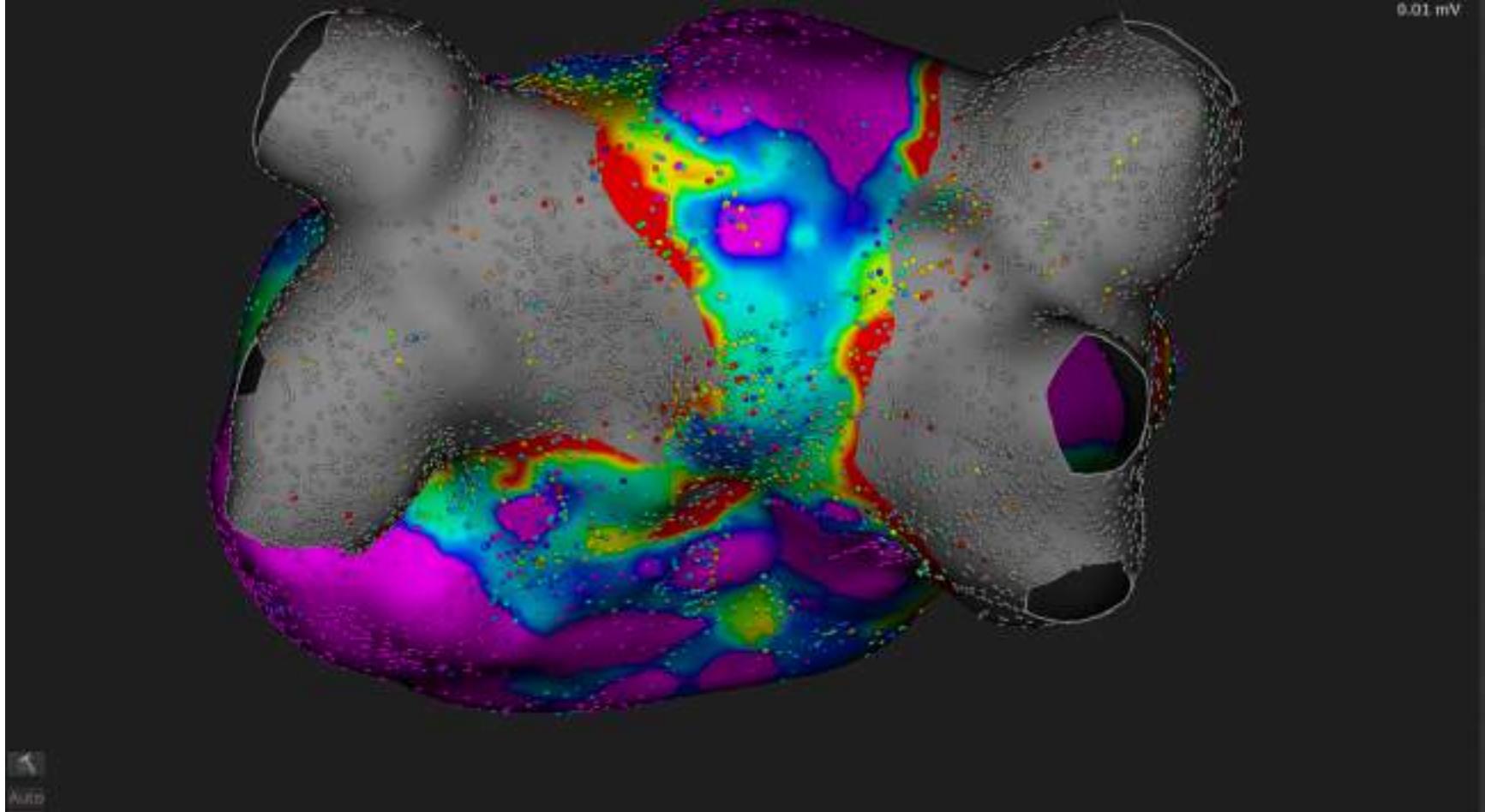
Pull Down Technique





Mr Est... isolation RSPV, 30 sec





0.01 mV

Rhythmia / Post cryo ablation Mr Dec.../1/2019

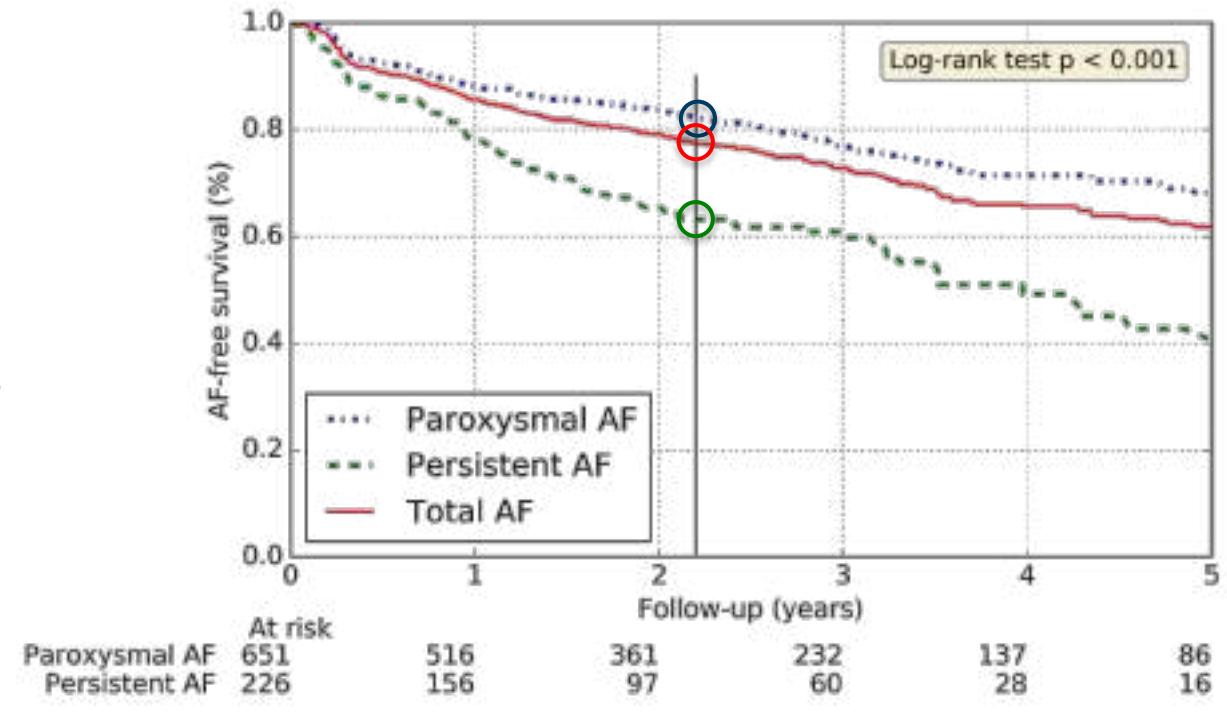
Results : after repeat procedures

Paroxysmal AF : 82 %

All AF : 78 %

Persistent AF 63 %

Median follow-up 2,5years



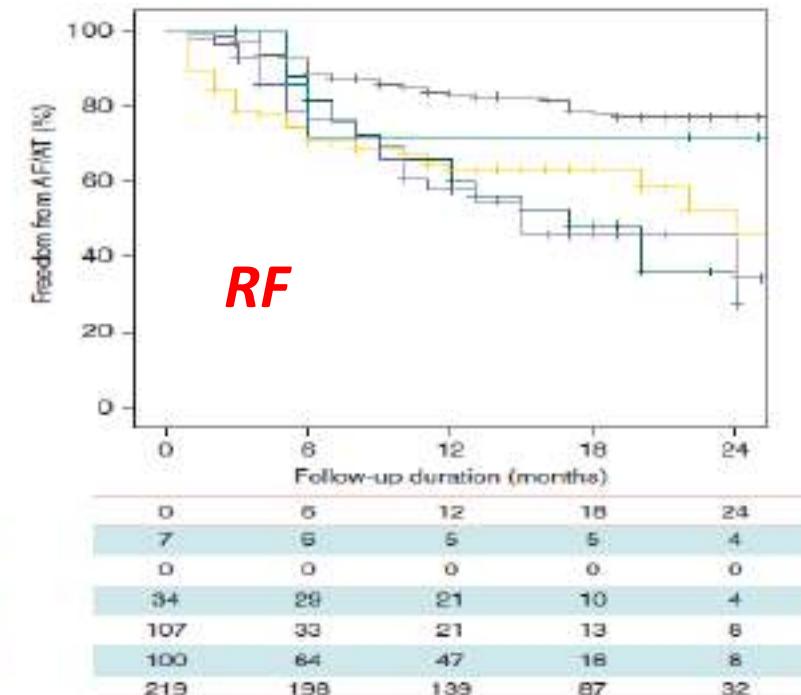
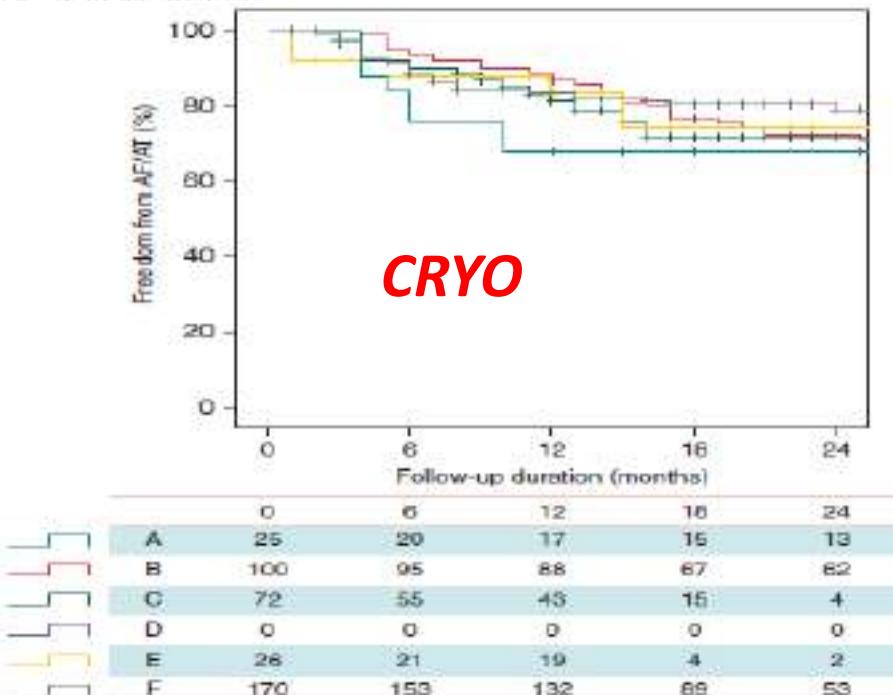
Rates of freedom from AF after last ablation attempt

Laurent E, Jacon P, Venier S, Defaye P. HRS 2017

Results from a multicentre comparison of cryoballoon vs. radiofrequency ablation for paroxysmal atrial fibrillation: is cryoablation more reproducible?

Rui Providencia^{1,2*}, Pascal Defaye¹, Pier D. Lambiase², Dominique Pavin⁴, Jean-Pierre Cebrol⁵, Franck Halimi⁶, Frédéric Anselme⁷, Neil Srinivasan⁸, Jean-Paul Albenque¹, and Serge Boveda¹

**Prospective, multicentre, 860 pts,
467 RF, 393 Cryo, FU 14 months (8-23)**



"Cryoballoon seems to be less operator-dependent and more reproducible than RF in the setting of paroxysmal AF ablation"

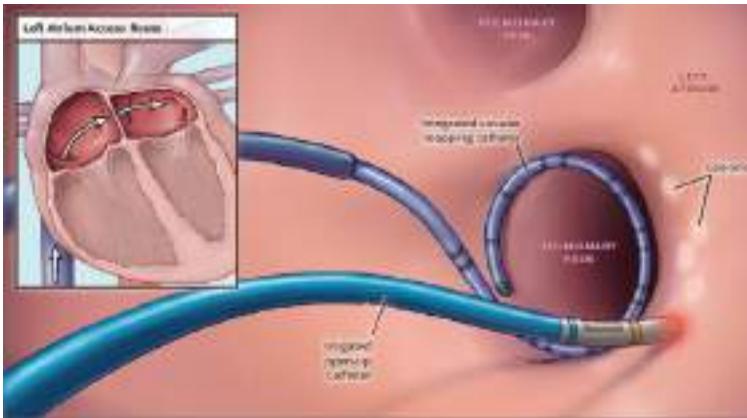
Europace 2017; 19, 48–57

Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

Karl-Heinz Kuck, M.D., Josep Brugada, M.D., Alexander Fürnkranz, M.D., Andreas Metzner, M.D., Feilin Quyang, M.D., K.R. Julian Chun, M.D., Arif Elvan, M.D., Ph.D., Thomas Arentz, M.D., Kurt Bestehorn, M.D., Stuart J. Peacock, Ph.D., Jean-Paul Alberique, M.D., Ph.D., and Claudio Tondo, M.D., Ph.D., for the FIRE AND ICE Investigators[†]

RF C Ablation (“FIRE”)

- Power was not exceed
 - 40 W at A/I aspect
 - 30 W at P/S aspect
- 3D mapping

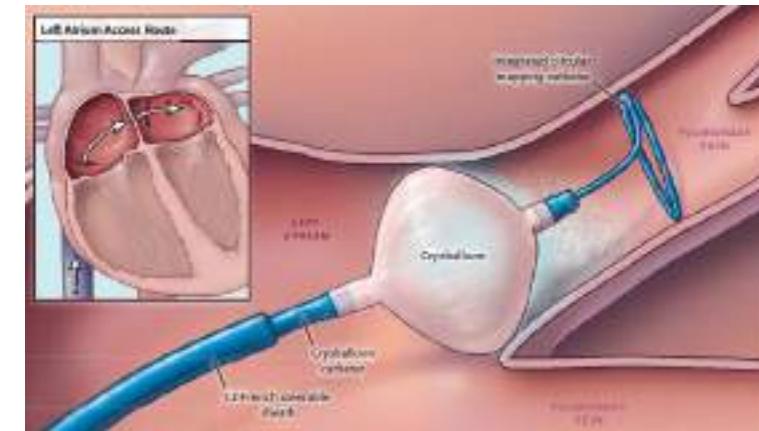


378 patients

Multicenter, RT to determine whether cryoballoon ablation was noninferior to RF ablation in symptomatic patients with drug-refractory paroxysmal AF

Cryoballoon Ablation (“ICE”)

- Max freeze duration : 240s
- Bonus freeze recommended after ablation
- Phrenic nerve pacing recommended



384 patients

New Engl J Med 2016

Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

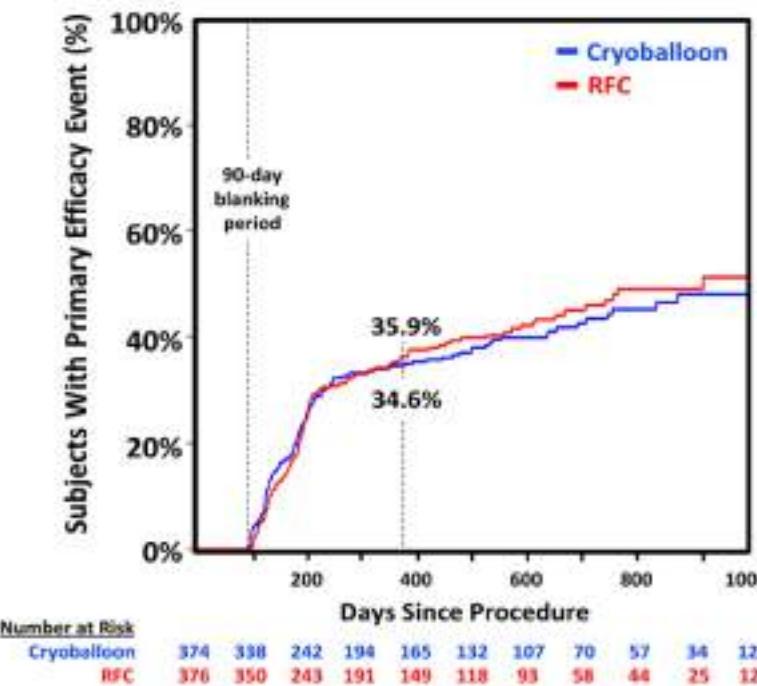
Karl-Heinz Kuck, M.D., Josep Brugada, M.D., Alexander Färnkrantz, M.D.,
Andreas Metzner, M.D., Feifan Quyang, M.D., K.R. Julian Chun, M.D.,
Arif Elvan, M.D., Ph.D., Thomas Arentz, M.D., Kurt Bestehorn, M.D.,
Stuart J. Pocock, Ph.D., Jean-Paul Alberniqual, M.D., Ph.D., and
Claudio Tondo, M.D., Ph.D., for the FIRE AND ICE Investigators*

FIRE AND ICE Trial Primary Endpoints *Cryoballoon Met Non-inferiority Efficacy Endpoint*

TRIAL DESIGN & METHODS

Prospective, 1:1 randomized, non-inferiority study (762 pts from 16 sites in 8 countries) compared efficacy and safety of PVI using Cryoballoon vs. RF ablation with CARTO® 3D mapping system in pts with PAF.

Primary Efficacy Endpoint: Time to first documented recurrence of AF>30s/AT/AFL, prescription of AAD, or repeat ablation.



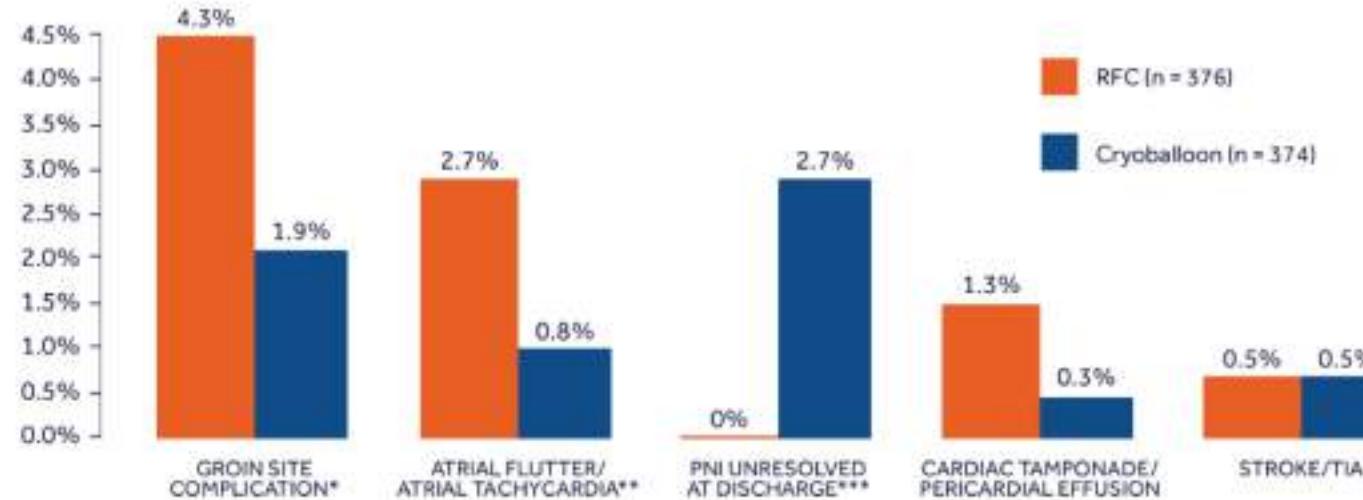
**SHORTER, MORE CONSISTENT PROCEDURE
TIMES IN CRYOBALLOON GROUP**

Measurement (minutes)	RFC (n=376)	Cryoballoon (n=374)	P- value**
Procedure Time***	140.9 ± 54.9	124.4 ± 39.0	<0.0001
LA Dwell Time***	108.6 ± 44.9	92.3 ± 31.4	<0.0001
Fluoroscopy Time	16.6 ± 17.8	21.7 ± 13.9	<0.0001

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Most frequently observed treatment-related SAEs



Primary Safety Endpoint results

RFC group 51 vs. Cryoballoon group 40
(HR=0.78; 95% CI=0.52-1.18; p=0.24)

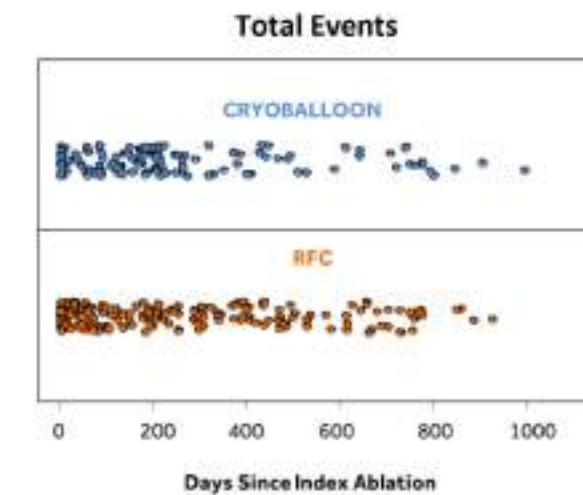
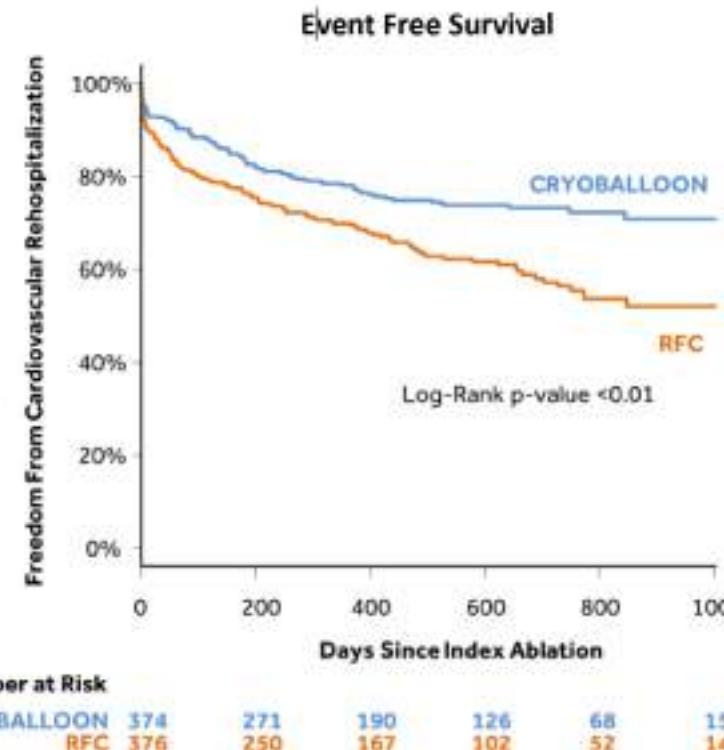
One-year Kaplan-Meier event rate estimates: 10.2% Cryoballoon and 12.8% RFC

Cryoballoon or radiofrequency ablation
for symptomatic paroxysmal atrial
fibrillation: reintervention, rehospitalization, and
quality-of-life outcomes in the FIRE AND ICE trial

Karl-Heinz Kuck¹, Alexander Fluekiger¹, K.R. Julian Chua², Andreas Hetzer³,
Peltin Ouyang⁴, Michael Schäfer¹, Arif Etham⁵, Hans W. Umlauf⁶, Fred J. Kauffler⁷,
Thomas Arentz⁸, Jean-Paul Alberque⁹, Claudio Toso¹⁰, Michael Küne¹¹,
Christian Sticherling¹², and Josep Brugada¹³, on behalf of the FIRE AND ICE
Investigators

Freedom from cardiovascular hospitalisation

34% fewer CV rehospitalizations in the CB group vs RF group



Cryo: 139 events in 89 subjects
(89/374; 23.8%)

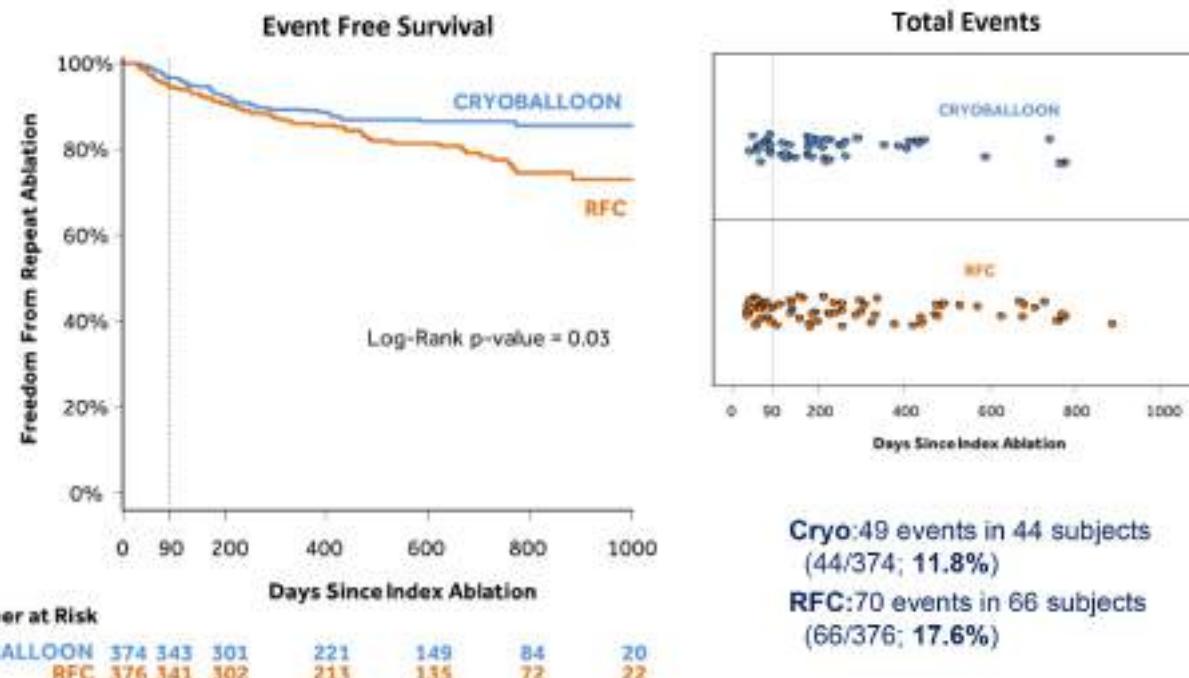
RFC: 203 events in 135 subjects
(135/376; 35.9%)

Cryoballoon or radiofrequency ablation
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Freedom from repeat ablation

33% Fewer Repeat Ablations in the Cryoballoon Group vs RF Group





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

The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC)

Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC

Ablation of Atrial Fibrillation : new guidelines

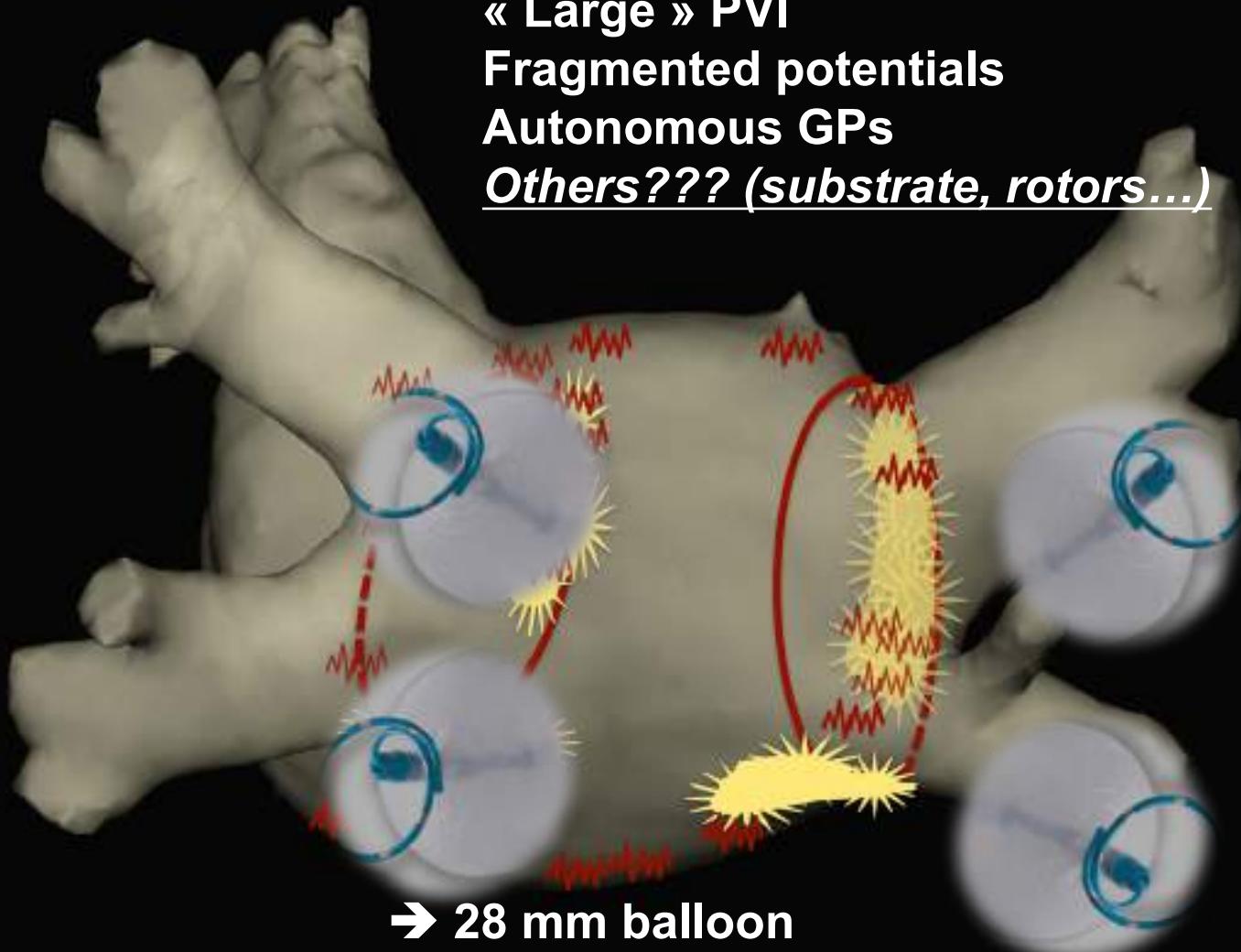
Recommendations	Class	Level
Catheter ablation of symptomatic paroxysmal AF is recommended to improve AF symptoms in patients who have symptomatic recurrences of AF on antiarrhythmic drug therapy (amiodarone, dofetilide, flecainide, propafenone, sotalol) and who prefer further rhythm control therapy, when performed by an electrophysiologist who has received appropriate training and is performing the procedure in an experienced centre.	I	A
Ablation of common atrial flutter should be considered to prevent recurrent flutter as part of an AF ablation procedure if flutter has been documented or occurs during the AF ablation.	IIa	B
Catheter ablation of AF should be considered as first-line therapy to prevent recurrent AF and to improve symptoms in selected patients with symptomatic paroxysmal AF as an alternative to antiarrhythmic drug therapy, considering patient choice, benefit, and risk.	IIa	B
All patients should receive oral anticoagulation for at least 3 weeks after catheter (IIaB) or surgical (IIaC) ablation.	IIa	B C
Anticoagulation for stroke prevention should be continued indefinitely after apparently successful catheter or surgical ablation of AF in patients at high-risk of	IIa	C

Catheter ablation should target isolation of the pulmonary veins using radiofrequency ablation or cryotherapy balloon catheters.

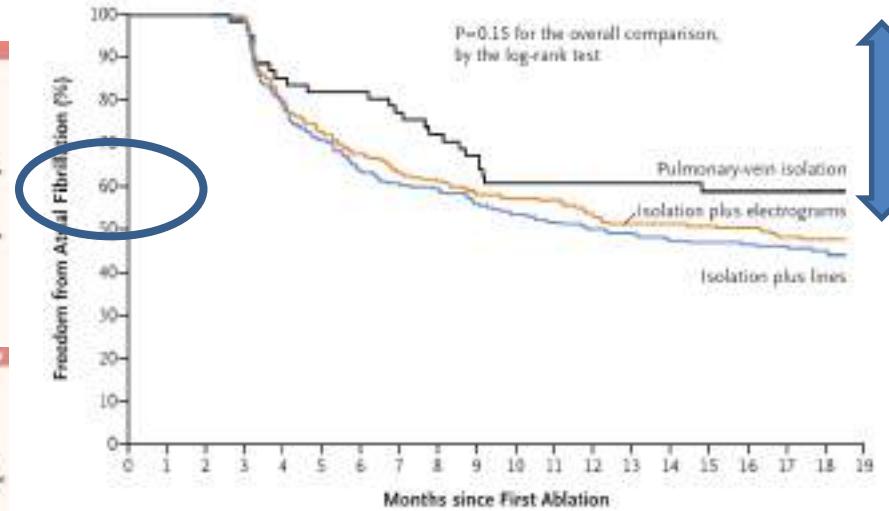
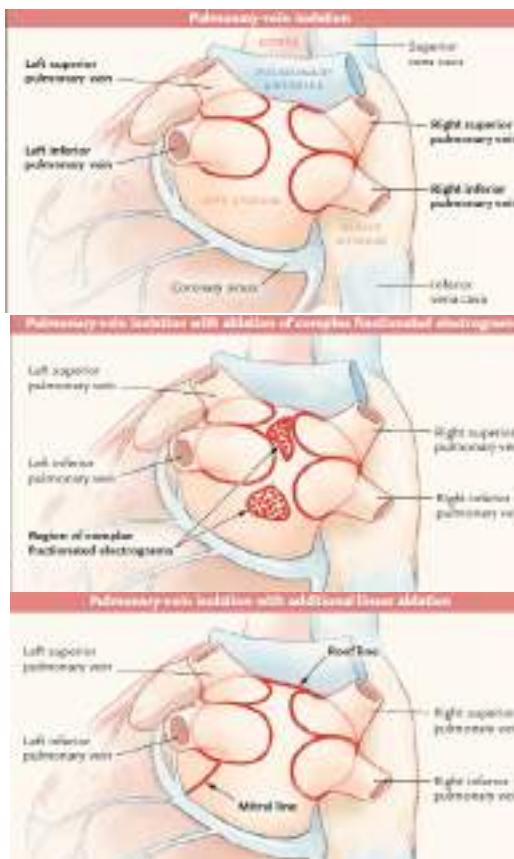
Catheter ablation should target isolation of the pulmonary veins using radiofrequency ablation or cryotherapy balloon catheters.

IIa	B
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« Large » PVI
Fragmented potentials
Autonomous GPs
Others??? (*substrate, rotors...*)



Approaches to Catheter Ablation for Persistent Atrial Fibrillation



No reduction in the rate of recurrent AF when either linear ablation or ablation of complex fractionated electrograms was performed in addition to PVI

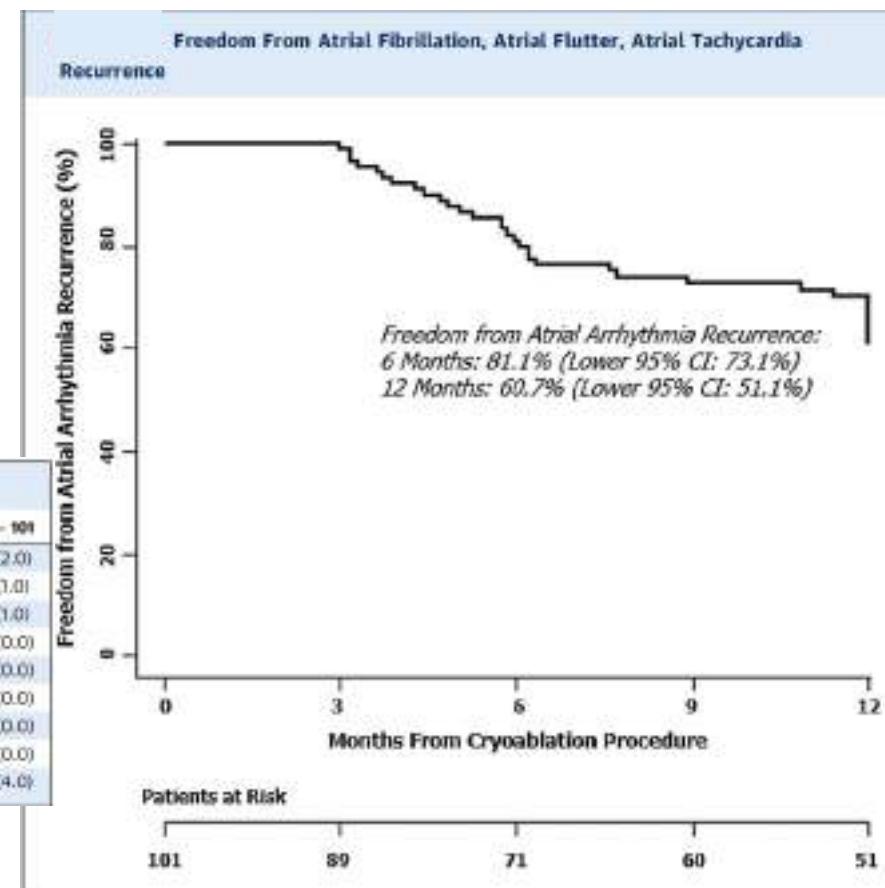
Single-Procedure Outcomes and Quality-of-Life Improvement 12 Months Post-Cryoballoon Ablation in Persistent Atrial Fibrillation

Results From the Multicenter CRYO4PERSISTENT AF Trial

Serge Boveda, MD,¹ Andreas Metzner, MD,¹ Dinh Q. Nguyen, MD,¹ K.R. Julian Chua, MB,² Ramaid Goshl, MD,² George Noecker, MD,¹ Jean-Claude Dehaco, MD,² George Andrikopoulos, MD,² Tillman Balme, MD,² Nicola Lilliech, MD,¹ Pascal Defaye, MD²

Patients' Baseline Characteristics

Demographics	N = 101
Male	75 (74.3)
Age, yrs	61.8 ± 10.5
PxAF onset, days	120.6 ± 98.0
CHADS-VASc	1.6 ± 1.3
BMI, kg/m ²	28.2 ± 4.2
Systolic BP, mm Hg	129.9 ± 14.0
Diastolic BP, mm Hg	82.0 ± 11.1
LAD, mm	43 ± 5
LVEF, %	56 ± 8
Coronary artery disease	5 (5.0)
Hypertension	63 (62.4)
Type II diabetes	5 (5.0)
Dyslipidemia	20 (19.8)
Smoking	22 (21.8)
Alcoholism	4 (4.0)
Prior DCCV <12 Months	51 (50.5)
Prior stroke/transient ischemic event	6 (4.0)
NYHA functional classification	
Subject does not have heart failure	46 (45.5)
I	23 (22.8)
II	26 (25.7)
III	5 (5.0)
IV	0 (0)
Not reported	1 (1.0)



**2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus
statement on catheter and surgical ablation of atrial fibrillation:
executive summary**

Posterior wall isolation might be considered for initial or repeat ablation of persistent or long-standing persistent AF.	IIb	C-LD
Administration of high-dose isoproterenol to screen for and then ablate non-PV triggers may be considered during initial or repeat AF ablation procedures in patients with paroxysmal, persistent, or long-standing persistent AF.	IIb	C-LD
DF-based ablation strategy is of unknown usefulness for AF ablation.	IIb	C-LD
The usefulness of creating linear ablation lesions in the right or left atrium as an initial or repeat ablation strategy for persistent or long-standing persistent AF is not well established.	IIb	B-NR
The usefulness of linear ablation lesions in the absence of macroreentrant atrial flutter is not well established.	IIb	C-LD

*360° Lesion
resulting in PVI in ~
3 minutes*

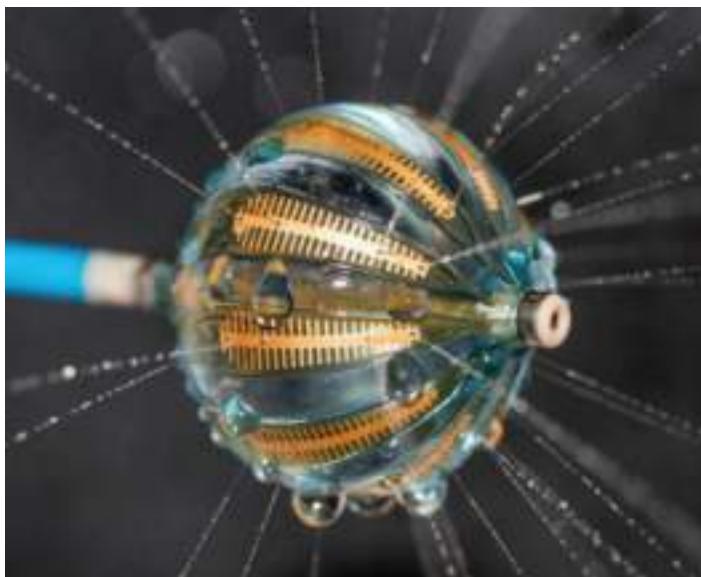


Other Alternatives... Visually-Guided Laser Balloon



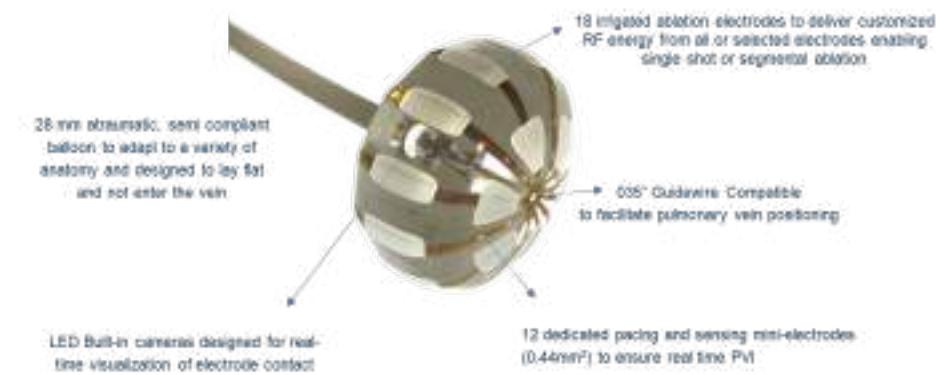
Other Alternatives...

Helios: Directionally – Ablation



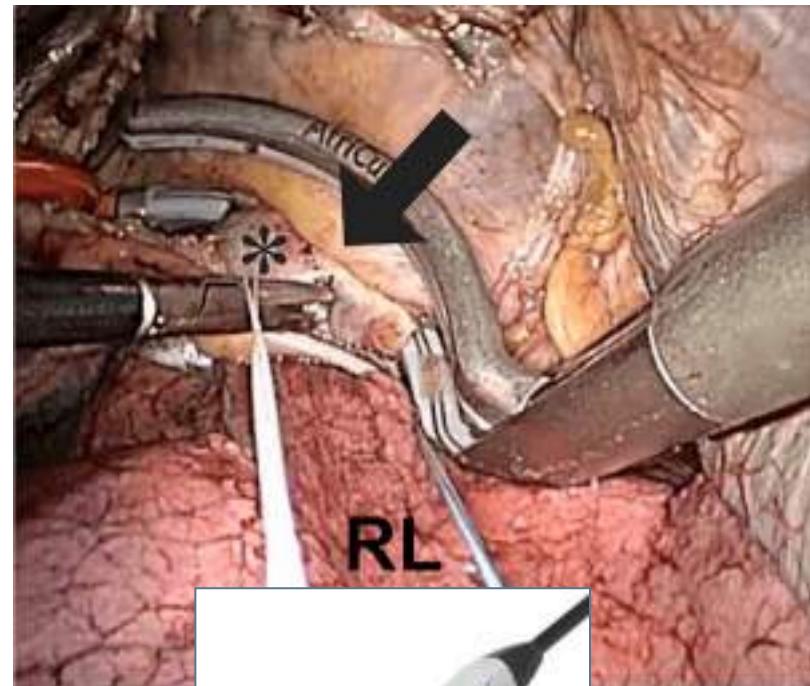
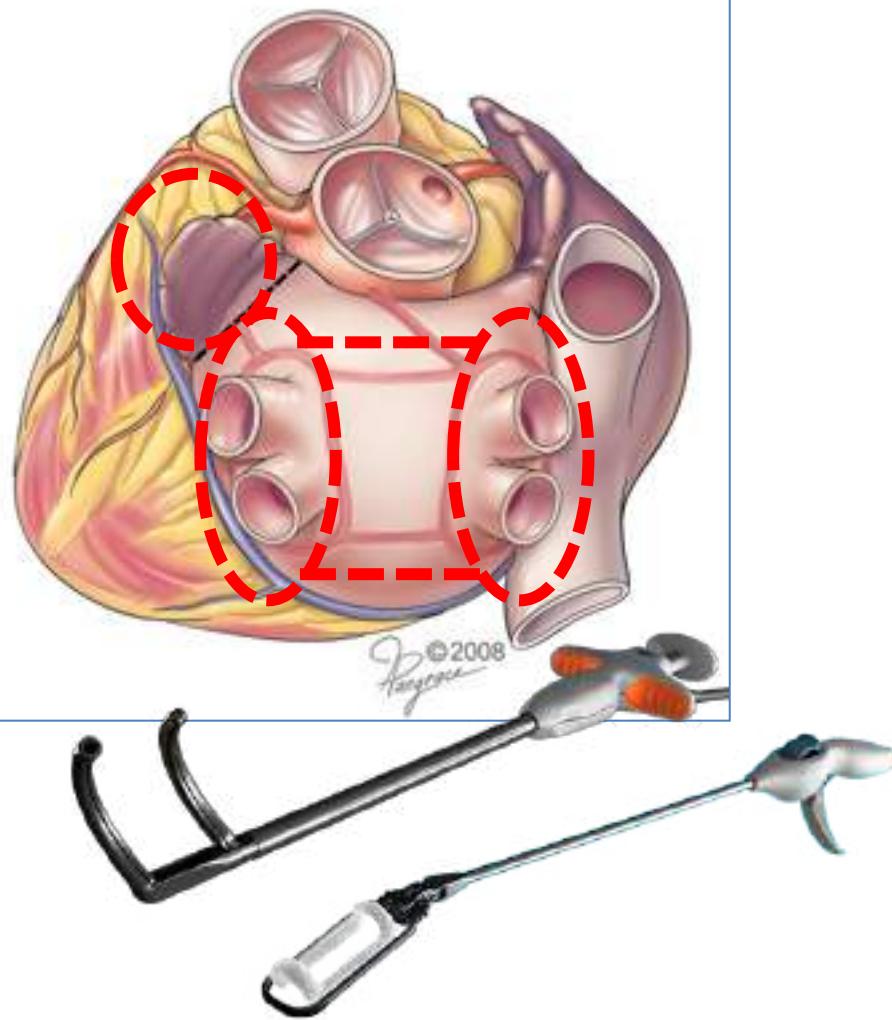
Luminize™ –

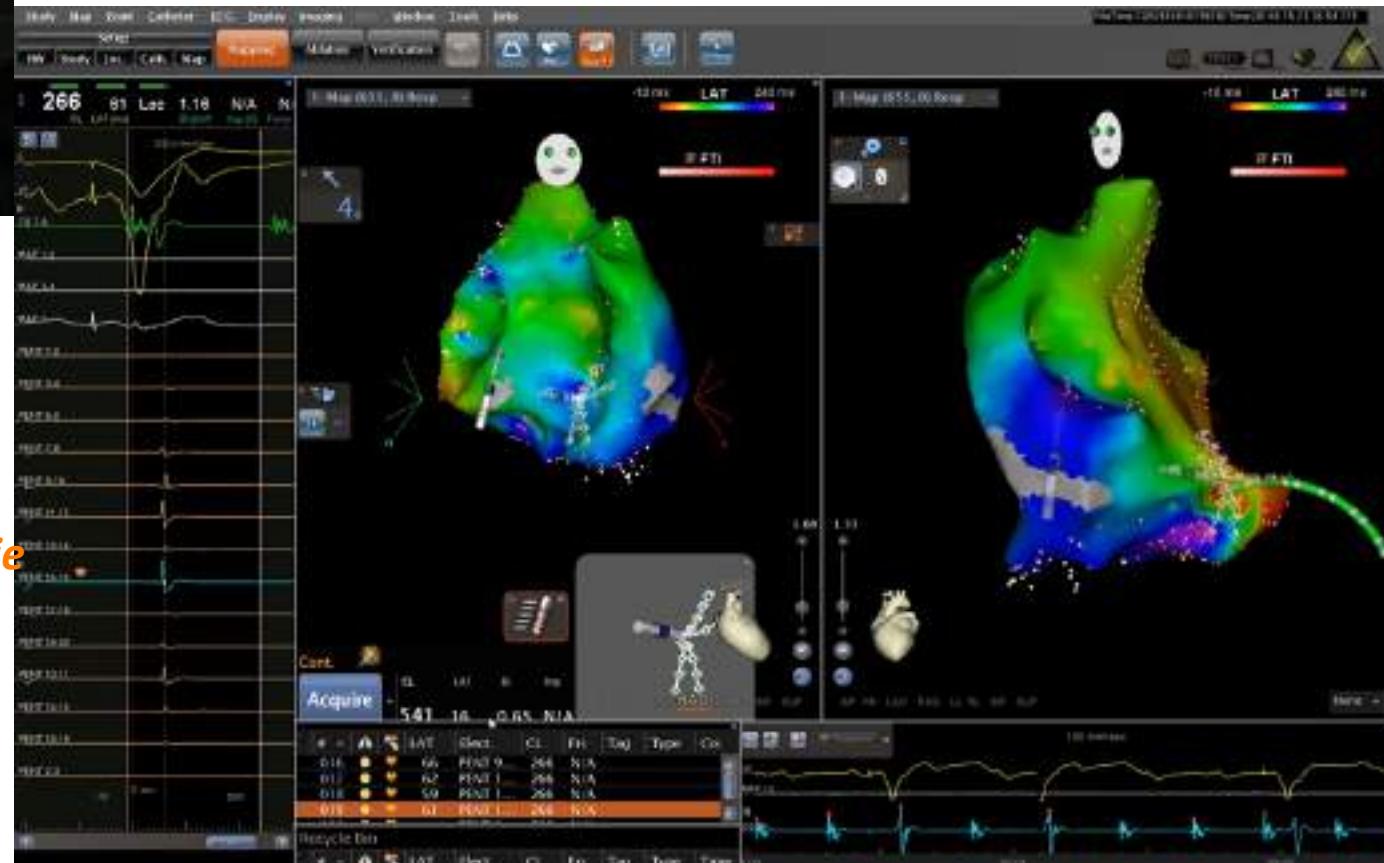
Visually-Guided – Titratable RFA



Investigational device study. Not available for sale.

Ablation FA chirurgicale





2^{ème} étape
Salle électrophysiologie
Contrôle ablation
Et complément sur
« gaps »

Catheter Ablation for Atrial Fibrillation with Heart Failure

Nassir F. Marmache, M.D., Johannes Bischmann, M.D., Dietrich Andersen, M.D., Jürgen Siebelis, M.D.,
 Lucas Boersma, M.D., Luc Jordens, M.D., Béla Merkely, M.D., Eszter Pokushalov, M.D.,
 Prashanthan Sanders, M.D., Jochen Pfeiff, B.S., Heribert Schunkert, M.D., Hildegarde Christ, M.D.,
 Jürgen Vogt, M.D., and Dietmar Illerisch, M.D., for the CASTLE-AF Investigators*

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CASTLE-AF

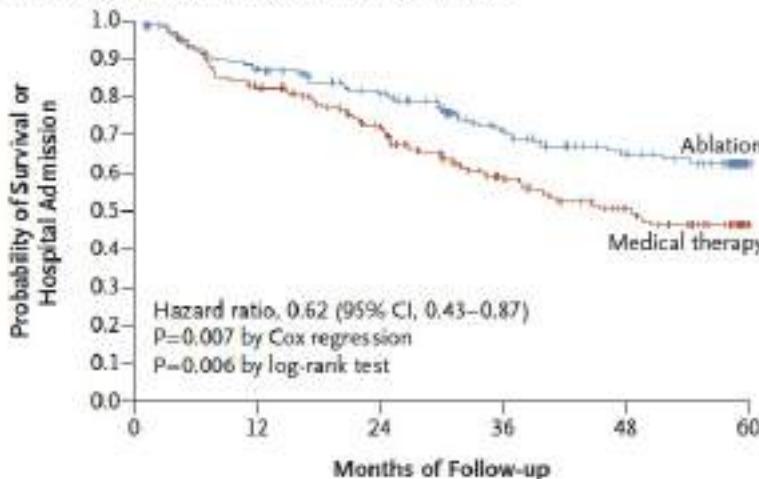
Table 1. Characteristics of the Patients at Baseline.^a

Characteristic	Treatment Type	
	Ablation (N = 179)	Medical Therapy (N = 184)
Age — yr		
Median	64	64
Range	56–71	56–71.1
Male sex — no. (%)	156 (87)	155 (84)
Body-mass index ^b		
Median	29.0	29.1
Range	25.9–32.2	25.9–32.3
New York Heart Association class — no./total no. (%)		
I	20/179 (11)	19/179 (11)
II	101/179 (58)	109/179 (61)
III	50/179 (28)	49/179 (27)
IV	3/179 (2)	2/179 (1)
Cause of heart failure — no. (%) ^c		
Ischemic	72 (40)	96 (52)
Nonischemic	107 (60)	88 (48)
Type of atrial fibrillation — no. (%)		
Paroxysmal	54 (30)	68 (35)
Persistent	125 (70)	120 (65)
Long-standing persistent (duration >1 year)	51 (28)	55 (30)
Left atrial diameter		
Total no. of patients evaluated	162	172
Median — mm	48.0	49.5
Interquartile range — mm	45.0–54.0	5.0–55.0
Left ventricular ejection fraction		
Total no. of patients evaluated	164	172
Median — %	32.3	31.3
Interquartile range — %	25.0–38.0	27.0–37.0
ICD implanted — no. (%) ^d	48 (27)	52 (28)
ICD implanted — no. (%) ^e	131 (71)	132 (72)
Dual-chamber	128 (72)	123 (67)
Single-lead device with “floating” atrial sensing dipole	3 (2)	9 (5)
Indication for ICD implantation — no. (%) ^f		
Primary prevention	160 (89)	163 (88)
Secondary prevention	19 (11)	21 (11)
History of anticoagulation use — no./total no. (%) ^g		
Failure	78/175 (45)	82/176 (47)
Unacceptable side effects	21/175 (12)	24/176 (14)
Normal	76/175 (43)	70/176 (40)

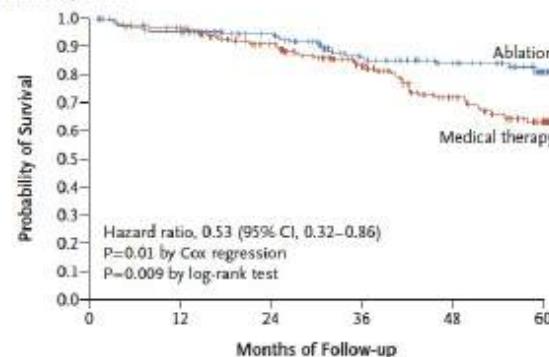
Catheter Ablation for Atrial Fibrillation with Heart Failure

Nassir F. Marouche, M.D.; Johannes Bischoffmann, M.D.; Dietrich Andersen, M.D.; Jürgen Siebel, M.D.; Lucas Boersma, M.D.; Luc Jordens, M.D.; Bela Merkely, M.D.; Ergeny Pokushalov, M.D.; Prashanthan Sanders, M.D.; Jochen Puff, B.S.; Heibert Schunkert, M.D.; Hildegarde Christ, M.D.; Jürgen Vogt, M.D., and Dietmar Bärtsch, M.D., for the CASTLE-AF Investigators*

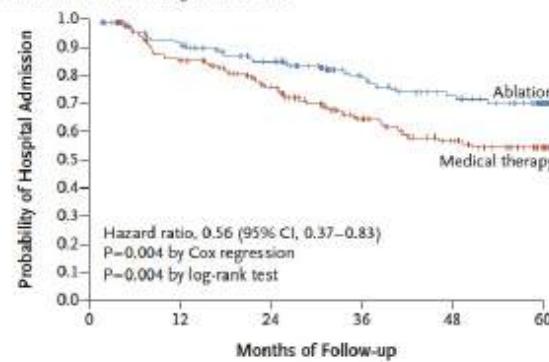
A Death or Hospitalization for Worsening Heart Failure



B Death from Any Cause



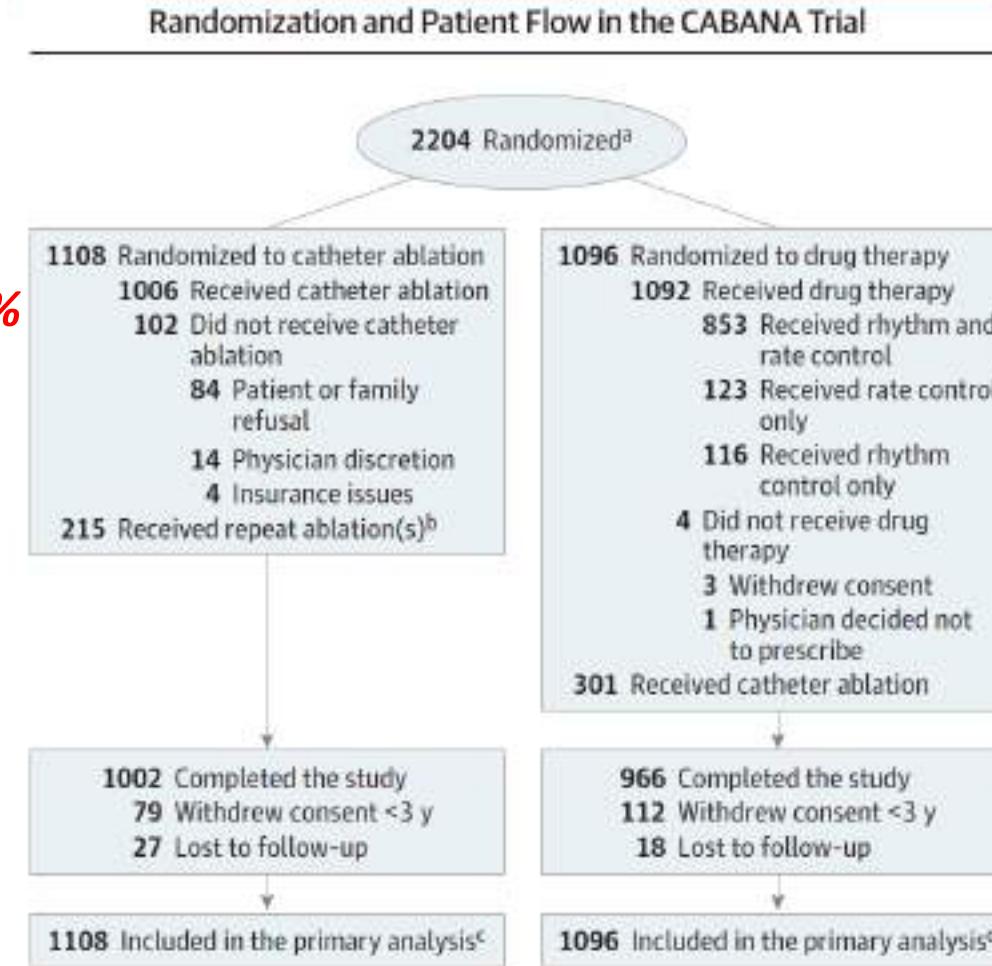
C Hospitalization for Worsening Heart Failure



**Effect of Catheter Ablation vs Antiarrhythmic Drug Therapy
on Mortality, Stroke, Bleeding, and Cardiac Arrest
Among Patients With Atrial Fibrillation**
The CABANA Randomized Clinical Trial

Douglas L, Fisher JD, Daniel S, Star L, KSD, MPH, Burkhardt D, Balducci PF, Gami LH, Mouloua M, Tchikane DJ, Bohman MD, Jassal E, Hause SD, Peter A, Rosenzweig ME, Yee D, Rosenthal ME, MPH, Head Jeffrey PhD, L, Bryant Mitchell, MD, Gaspard, Fabre, MD, Teplyuk Polotsky, MD, Mihnevski Petkovska, MD, L, Javid Bilezikian, MD, George Antoniou, MD, Anthony Attwells, BSc, Michael Neuzil, MD, David J. Wilber, MD, Francesco Cappato, MD, Vasilis Karayannidis, MD, Harikrishna Madhavan, MD, D. Vyne Sadasivam, MD, Peter B. Rosen, MD, Gerald E. Naccarelli, MD, James A. Steinberg, MD, Jonathan P. Piccini, MD, MPH, Alvaro P. Umerman, MD, Hosseini B, Al-Shabani, PhD, Harry L, Lee, PhD from the CABANA Investigators

CABANA



Effect of Catheter Ablation vs Antiarrhythmic Drug Therapy on Mortality, Stroke, Bleeding, and Cardiac Arrest Among Patients With Atrial Fibrillation: The CABANA Randomized Clinical Trial

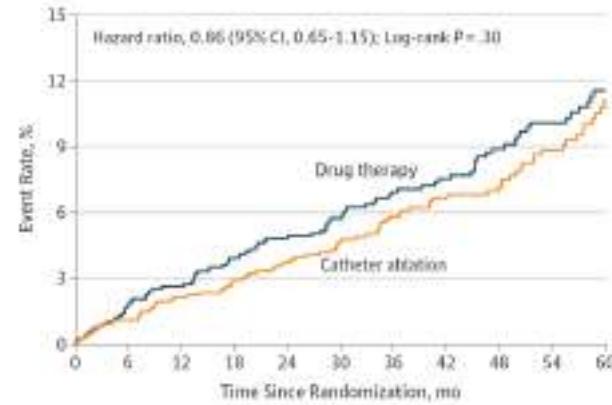
Douglas L, Pavie DG, David R, Stein KE, MPH; Redman S, Balduzzi P, MD; Gami H, Mavrikis DS; Tchikane D, Bahrami, MD; Souza C, Paiva SB; Peter A, Naseemuddin, MD; Yves D, Roemerberg, MD; John J, Jeffries, PhD; L, Bryant Michel, MD; George C, Fisher, MD; Eugene Polotsky, MD; Michael Portman, MD; T, David Bruck, MD; Seung-Jae Lee, MD; Holley, Anthony, MD; Antoinette Rennert, MD; David J, Wilcox, MD; Ricardo Capraro, MD; Kaitlin D'Amato, MD; Daniel J, Winkle, MD; Peter R, Roman, MD; Gerald E, Kawut, MD; Jeremy A, Gottlieb, MD; Jonathan P, Wyndham, MD; Michael J, Attwells, MD; Christopher M, Hayslip, MD; Michael B, Al-Mheid, PhD; James L, Lee, PhD; for the CABANA Investigators

Baseline Characteristic	N, (%)	
	Catheter Ablation (n = 1108)	Drug Therapy (n = 1096)
Arrhythmia History		
Time since onset of AF, y		
Median (Q1, Q3)	1.1 (0.3, 4.1)	1.1 (0.3, 3.7)
Type of AF at enrollment ^a		
Persistent	524 (47.3)	518 (47.3)
Paroxysmal	470 (42.4)	476 (43.5)
Long-standing persistent	114 (10.3)	101 (9.2)
Prior hospitalization for AF	449 (40.6)	423 (38.8)
Prior direct cardioversion	398 (36.0)	411 (37.5)
History of atrial flutter	140 (12.9)	158 (14.6)
Prior ablation for atrial flutter	48 (4.3)	60 (5.5)
Rhythm control therapy ^b		
≥1 Rhythm control drug	398 (81.6)	452 (82.2)
≥2 Rhythm control drugs	90 (18.4)	98 (17.8)

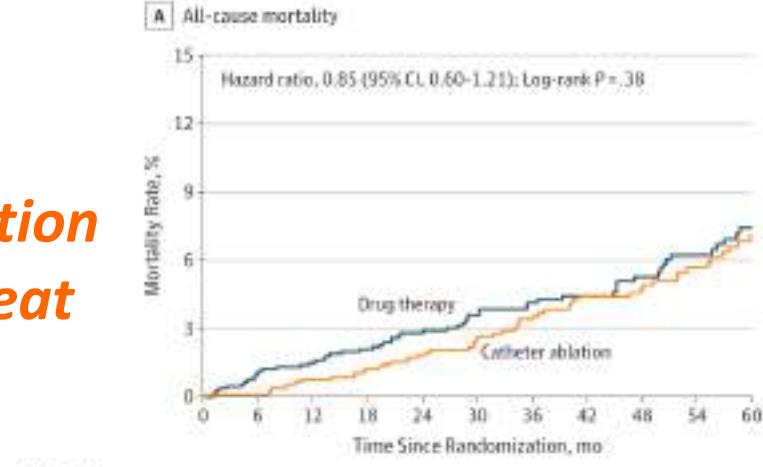
Baseline Demographics and Clinical Characteristics		
Baseline Characteristic	Catheter Ablation (n = 1108)	Drug Therapy (n = 1096)
Medical history		
Hypertension or LVH ^c	924 (83.4)	927 (84.7)
Hypertension	876 (79.1)	900 (82.2)
LVH	334 (38.7)	328 (42.1)
Diabetes	280 (25.3)	281 (25.7)
Sleep apnea	262 (23.6)	246 (22.5)
Coronary artery disease	208 (18.8)	216 (19.7)
Heart failure	174 (15.7)	163 (14.9)
Family history of AF	130 (11.8)	122 (11.2)
Prior CVA or TIA	117 (10.6)	103 (9.4)
Prior CVA	68 (6.1)	58 (5.3)
Thromboembolic events	41 (3.7)	49 (4.5)
Ejection fraction ≤35%	38/790 (4.8)	31/740 (4.2)
Comorbidities		
CHA ₂ DS ₂ -VASc ^d		
Median (Q1, Q3)	3.0 (2.0, 4.0)	3.0 (2.0, 4.0)
0-1 (Lowest risk)	208 (18.8)	187 (17.1)
2	273 (24.6)	291 (26.6)
3	308 (27.8)	329 (30.0)
4	178 (16.1)	151 (13.8)
≥5 (Highest risk)	141 (12.7)	138 (12.6)

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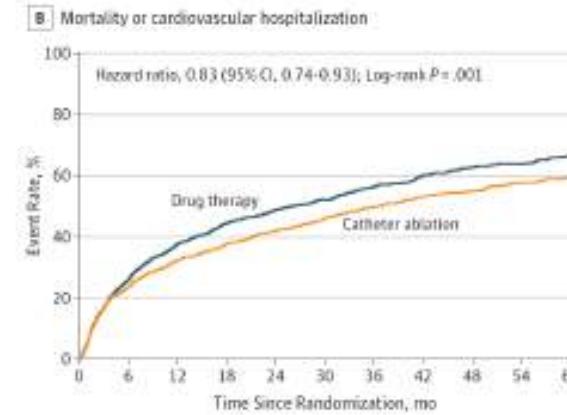
Douglas L, Pashkow DS, David R, Blatt A, Kellis MPA, Redman S, Tedaldi M, Gami H, Massie BH, Trutanich D, Bahrami MD, Justice C, Roche SD, Peter A, Rosenzweig ME, Yee J, Rosenberg ME, Laffey J, Heit J, Jeffries PH, L, Bryant Michel, MT, Leipzig C, Parker MD, Fagan-Polydoros MD, McDonald-Potterton MD, T, Javid Bacht MD, Seeger-Wadhera RD, Holtey AW, Anticoe J, Stothard MM, Glantz J, Wilcox MD, Riccardi Capponi E, El-Sherif N, El-Sherif M, Vassilakis J, Vassilaki J, Petrucci R, Roman MD, Caselli U, Kawachi M, Jerry A, Goff PL, MD, Sartorelli P, Wyzinski ME, Myers AJ, Okenayem MG, Homan R, Al-Mashad PhD, Kelly L, Lee PE, for the CABANA Investigators



*Intention
to treat*



No. at risk	Drug therapy	Catheter ablation
1096	1046	1023
1108	1058	1035
	1013	992
	903	933
	783	814
	679	724
	606	632
	527	555
	445	455
	334	332



1096	778	643	563	474	387	302	244	197	165	112
1108	807	708	643	558	450	372	307	261	207	137

Primary end-point :
Stroke, death, serious bleeding, cardiac arrest

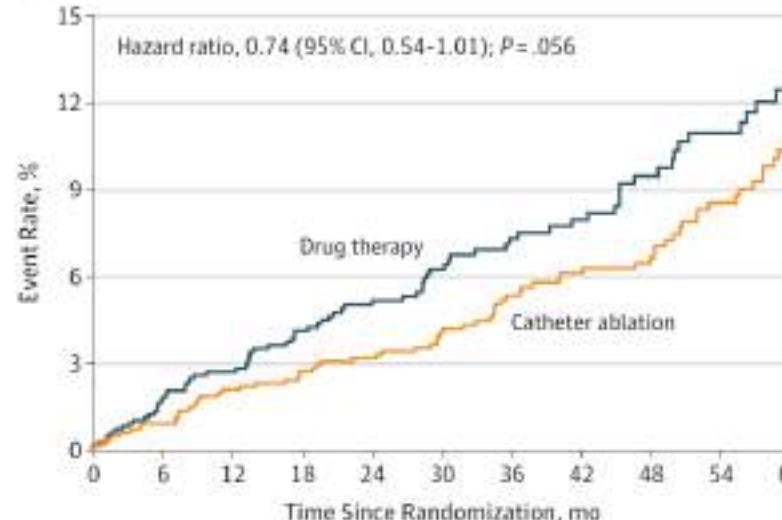
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Per-protocol

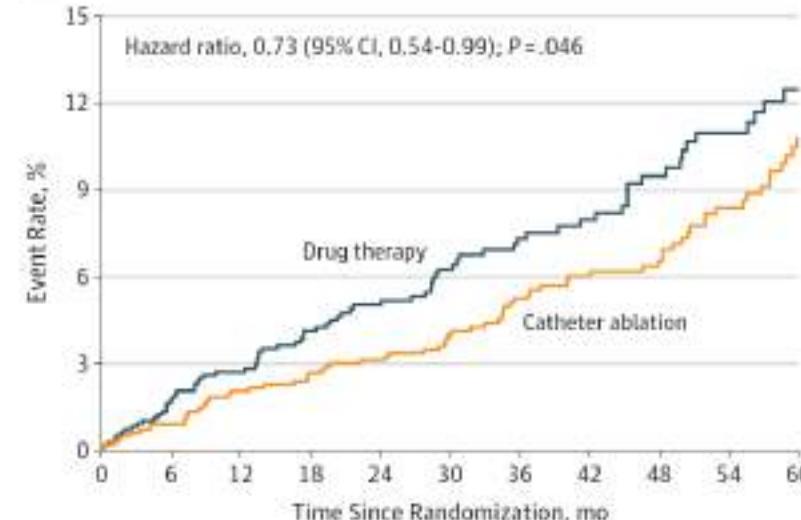
Douglas L, Foster SD, Doriani S, Blaak E, Gold MR, Becker L, Rabbani H, Macdonald RH, Teague G, Bohman MH, Jacobsen C, Flute RR,
 Peter A, Kowey PR, Mitrani RV, Mittleman MA, Bergström AH, Meltzer RS, Tamm羽nig M, L, Bryant Michal, MH, Geng J, Fisher MN,
 McDonald Christopher, MD, L, Vassilios Botsis, MD, George Kyriakis, MD, Antonio Bernicki, MD, David J, Miller, MD,
 Michael Caporuso, MD, Karl Grimes, MD, Michael Hembrock, MD, O. Wayne Davis, MD, Peter R. Norton, MD, David E. Newell, MD,
 James A. Daugherty, MD, Jonathan P. Heydt, MD, Michael Almond, MD, Christopher M. Moore, MD, Daniel J. Lee, PhD from the CABANA Investigators

Kaplan-Meier Estimates of the Primary End Point by Per-Protocol Analysis

A At 6 mo



B At 12 mo



No. at risk

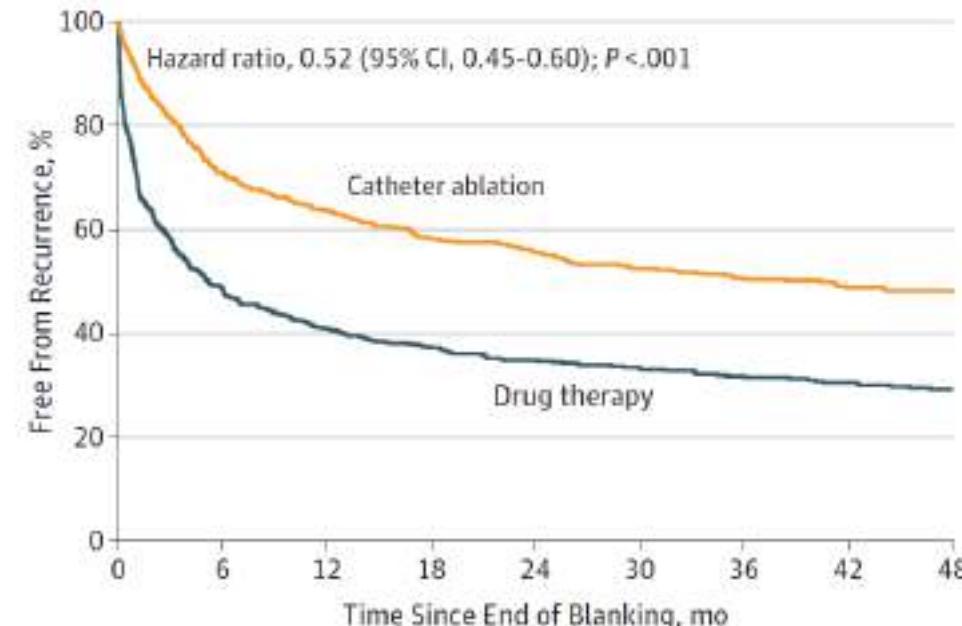
	Drug therapy	954	860	778	680	566	464	396	330	275	204	
	Catheter ablation	970	941	920	901	835	721	636	555	483	397	287

1096	954	860	778	680	566	464	396	330	275	204
987	958	937	918	849	735	648	566	494	404	291

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Douglas L, Foster DR, Danzon M, Liu L, Bellamy DH, Bellamy JH, McDonald JRS, Tchoukjian G, Bohmeyer MD, Jacobs C, Flute BD,
Peter A, Kowey PR, McNamara V, McPherson AJ, Bergström AJ, Bellamy J, Bellamy P, Bellamy L, Bryant Michael, McNamara C, Peters MC,
McDonald Christopher, MD; The CABANA Investigators, MS; Society of Thoracic Surgeons, MS; Writing Committee, MS; American Heart Association, MS; American Thoracic Society, MS; Council of Arrhythmia, MS;
Research Corporation, MS; Yale University, MS; Hospital of the University of Pennsylvania, MS; Peter B, Nussey MD; David E, Kavcicoff, MD;
James A, Doshi MD; Jennifer P, Heyndrickx, MD; Michael J, Shemesh, MD; Howard R, Al-Mubashir, PhD; Henry L, Lee, PhD) for the CABANA Investigators

Recurrent Atrial Fibrillation After Blanking by Intention-to-Treat Analysis



Per-protocol

No. at risk	Drug therapy	Catheter ablation								
Drug therapy	629	611	304	432	252	381	212	328	181	291
Catheter ablation										

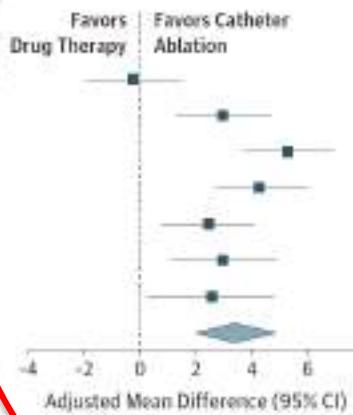
Effect of Catheter Ablation vs Medical Therapy on Quality of Life Among Patients With Atrial Fibrillation The CABANA Randomized Clinical Trial

Daniel B. Mark, MD, MPH; Kevin J. Asterope, PhD; Shulin Sheng, PhD; Jonathan P. Piccirillo, MD, MHSc; Ilhaud N. Boloch, MPH;
Kerry H. Monahan, RN; Melinda E. Daniels, BA; Trishram D. Bahman, MD; Jeanne E. Poole, MD; Yann Rosenberg, MD, MPH;
Kerry L. Lee, PhD; Douglas L. Padler, MD; for the CABANA Investigators

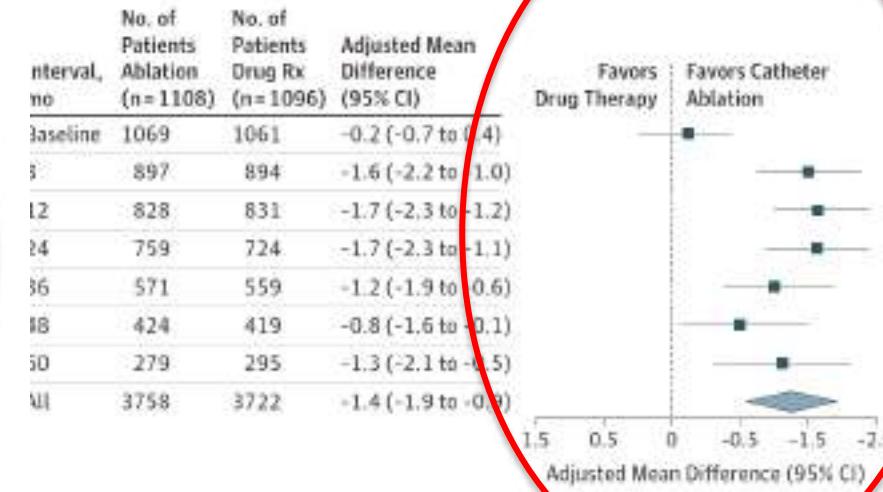
QOL

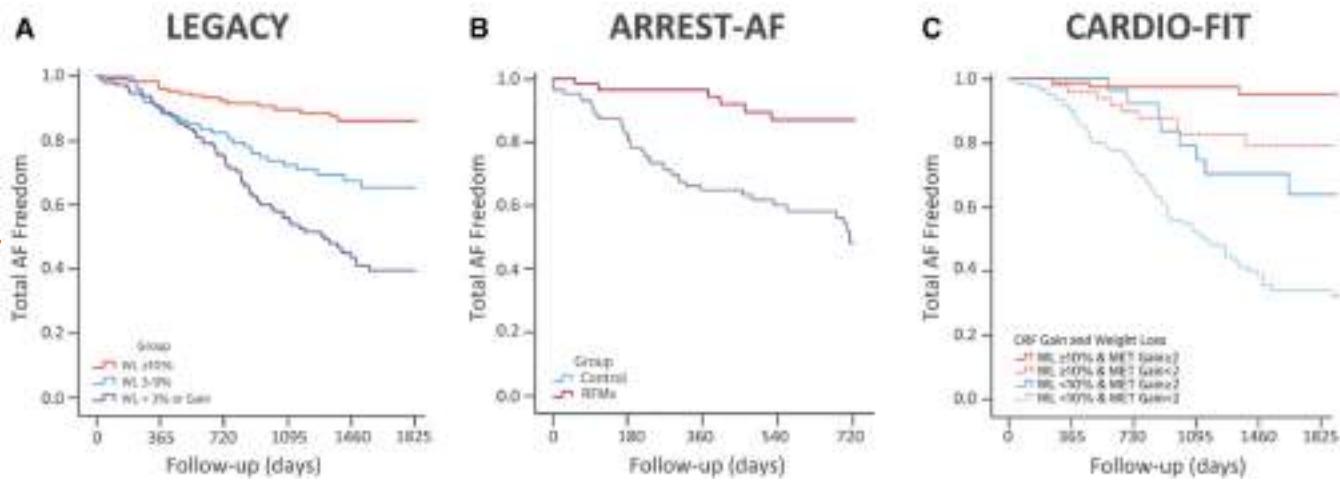
B Between-group AFEQT summary score difference:

Interval, mo	No. of Patients Ablation (n=1108)	No. of Patients Drug Rx (n=1096)	Adjusted Mean Difference (95% CI)
Baseline	1084	1078	-0.2 (-1.9 to 1.5)
3	971	983	3.0 (1.3 to 4.7)
12	915	903	5.3 (3.7 to 6.9)
24	856	798	4.3 (2.7 to 6.0)
36	645	605	2.5 (0.8 to 4.1)
48	476	473	3.0 (1.1 to 4.9)
60	329	320	2.6 (0.3 to 4.9)
All	4192	4082	3.4 (2.1 to 4.7)



B Between-group MAFSI frequency score difference:





Aggressive Risk Factor Management

Weight Management and Exercise

- Educate for permanent lifestyle change
- Diet Plan
- Initial target: >10% weight loss
- Final target: BMI <27 kg/m²
- Avoid weight fluctuation
- Exercise: 30 minutes for 3-4x per week
- Increase type and duration of activity up to 250 minutes per week

Hyperlipidaemia

- Initial lifestyle measures
- At 3 months: start statins if LDL >100 mg/dL
- Add fibrates if TG >200 mg/dL
- Start fibrates if TG >500 mg/dL

Obstructive Sleep Apnea

- Overnight sleep study
- CPAP if AHI >30; or >20/h with resistant HT or daytime somnolence
- Add fibrates if TG >200 mg/dL
- Check adherence regular CPAP machine data download

Hypertension

- Home BP diary 2-3 x daily
- Reduce salt
- Start ACEI or ARB
- Target: <130/80 mmHg (or next) & <200/100 mmHg (at peak exercise)

Diabetes

**Components of risk factor modification
in ARREST-AF and LEGACY studies**

Impact of Body Mass Index on the Outcomes of Catheter Ablation of Atrial Fibrillation: An European Observational Multicenter Study

Rai Providence MD PhD^{1,2}, Pedro Adriano MD PhD¹, Carlos de Aramunda MD PhD¹, Julian Chan MD¹,

Gianfratello Chierchia MD PhD¹, Pascal Defaye MD¹, Frédéric Asselme MD PhD¹, Antonio Costa MD¹, Pier D.

Lambrose PhD FRCP FRS¹, Boris Schmidt MD¹, Shaohie Chen MD¹, Diogo Cavaco MD¹, Ross J. Hunter MD¹, Joao

Carvalho MD¹, Stephane Combes MD¹, Shohreh Hosseini-Shahidi BS¹, Nicolas Combes MD¹, Maria Joao Sousa MD¹,

Zeynab Jebbi MD, Jean-Paul Alberque MD¹, Serge Bovet MD¹.

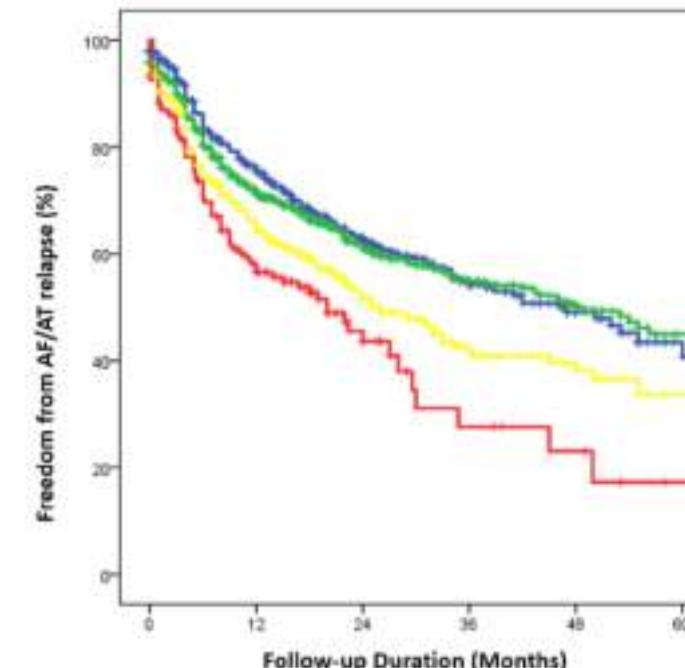
**Predictors of post-blanking
atrial arrhythmia relapse
after an ablation procedure**

Variable	Univariate Cox Regression			Multivariate Cox Regression		
	HR	95%CI	P	HR	95%CI	P
Age (per year)	1.01	1.00-1.02	0.008	-	-	-
Female gender	1.20	1.02-1.41	0.024	-	-	-
AF duration (per year)	1.03	1.02-1.04	<0.001	1.03	1.02-1.04	<0.001
Paroxysmal AF	0.52	0.45-0.60	<0.001	0.51	0.43-0.60	<0.001
Congestive heart failure	1.58	1.24-2.00	<0.001	-	-	-
Hypertension	1.23	1.06-1.43	0.007	-	-	-
Diabetes mellitus	1.44	1.14-1.81	0.002	1.36	1.05-1.77	0.019
Stroke or TIA	1.31	1.00-1.61	0.051	-	-	-
Vascular disease	1.19	0.94-1.53	0.155	-	-	-
Obstructive Sleep Apnea	1.48	1.15-1.91	0.003	1.35	1.02-1.77	0.034
CHA ₂ DS ₂ -VASc	1.13	1.07-1.19	<0.001	-	-	-
BMI (per Kg/m ²)	1.01	1.00-1.01	0.044	1.01	1.00-1.02	0.002
eGFR (per ml/min)	0.99	0.99-1.00	0.073	-	-	-
Indexed LA volume (per mL/m ²)	1.01	1.01-1.02	<0.001	-	-	-
LVEF (per %)	0.99	0.98-0.99	0.002	-	-	-
Cryoballoon ablation	0.92	0.78-1.08	0.293	-	-	-

Impact of Body Mass Index on the Outcomes of Catheter Ablation of Atrial Fibrillation: An European Observational Multicenter Study

Rai Providence MD PhD^{1,2,3}, Pedro Adriano MD PhD⁴, Carlos de Aramunda MD PhD⁵, Julian Chan MD⁶, Giambattista Chierchia MD PhD⁶, Pascal Defaye MD⁷, Frédéric Arnalise MD PhD⁸, Antonio Costa MD⁹, Pier D. Lambiase PhD FRCP FRS¹⁰, Boris Schmidt MD¹¹, Shaohie Chen MD¹², Diogo Cavaco MD¹³, Ross J. Hunter MD¹⁴, Joao Carvalho MD¹⁵, Stephane Combes MD¹⁶, Shohreh Hosseiniashvili BS¹⁷, Nicolas Combes MD¹⁸, Maria Joao Sousa MD¹⁹, Zeynab Jebbi MD²⁰, Jean-Paul Alberque MD²¹, Serge Bovet MD²².

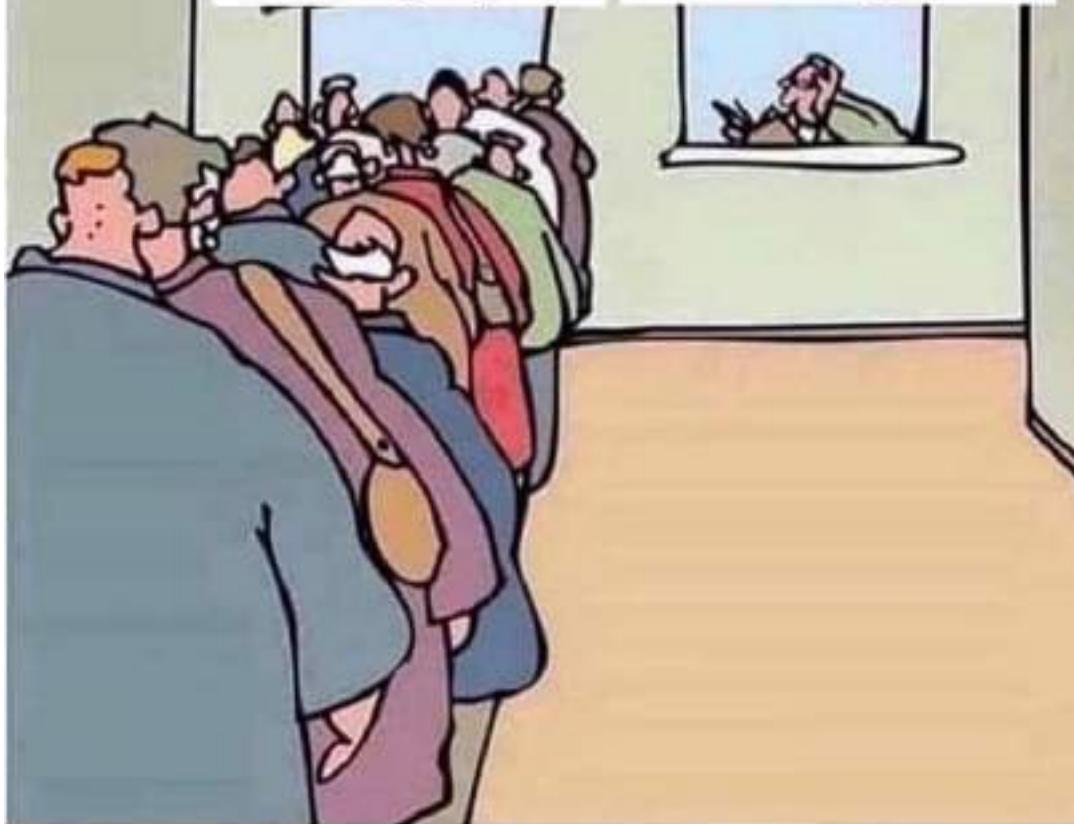
Freedom from atrial arrhythmia relapse stratified by BMI class for all patients



	0M	12M	24M	36M	48M	60M
<25Kg/m ²	711	437	216	91	52	16
25-30Kg/m ²	1,092	606	289	151	82	30
30-35Kg/m ²	508	268	113	48	27	9
≥35Kg/m ²	186	79	24	8	5	1

**Pills and
Surgery**

**Lifestyle
Change**



Weight reduction in patients with atrial fibrillation

Recommendations	Class	Level
In obese patients with AF, weight loss together with management of other risk factors should be considered to reduce AF burden and symptoms.	IIa	B

Management of respiratory diseases in patients with atrial fibrillation

*ESC guidelines 2016
EHJ 2016*

Recommendations	Class	Level
Correction of hypoxaemia and acidosis should be considered as initial management for patients who develop AF during an acute pulmonary illness or exacerbation of chronic pulmonary disease.	IIa	C
Interrogation for clinical signs of obstructive sleep apnoea should be considered in all AF patients.	IIa	B
Obstructive sleep apnoea treatment should be optimized to reduce AF recurrences and improve AF treatment results.	IIa	B

**2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS
Guideline for the Management of Patients With Atrial Fibrillation**

A Report of the American College of Cardiology/American Heart Association Task Force on
Clinical Practice Guidelines and the Heart Rhythm Society

COR	LOE	Recommendation
I	B-R	<p>1. For overweight and obese patients with AF, weight loss, combined with risk factor modification, is recommended (S7.13-1–S7.13-3).</p> <p>NEW: New data demonstrate the beneficial effects of weight loss and risk factor modification on controlling AF.</p>

Conclusion I

- FA : arythmie très fréquente :
 - jeunes aussi,
 - sportifs,
 - et ... vieillissement population
- Stratégie de **dépistage opportuniste** de la FA : Classe I >65 ans
- Dépistage de la FA par ECG longue durée : indication de classe I après AIT/AVC ischémique/ AVC cryptogénique
- Enormes progrès des **outils diagnostiques** dans le dépistage de la FA : Holter/ILR/ mémoires embarquées, AppleWatch®
- AOD : traitement de référence : CHA₂DS₂Vasc≥2

Conclusion II

- Enorme développement des techniques interventionnelles
- **Cryoballon** : technique de référence dans l'ablation de la FA en 1ère intention
- Procédures équivalentes en terme de résultats à long terme/ RF
mais moins de complications et procédures plus courtes et moins complexe

→ *TTt de 1^{ère} ligne dans la FA paroxystique*

- FA persistante : autre “challenge” avec taux de succès moindre mais cryo équivalente aux autres techniques : RF, chirurgie...
- Développement actuel d'autres outils « one-shot »
- Dernières grandes études :
 - **CASTLE AF** : >0 : FA + Insuffisance cardiaque
 - **CABANA** : à interpréter en intention de traiter /per-protocol