

# **PREVENTION OF ATRIAL FIBRILLATION PROGRESSION BY CATHETER ABLATION**

Turin, 13<sup>th</sup> October 2016



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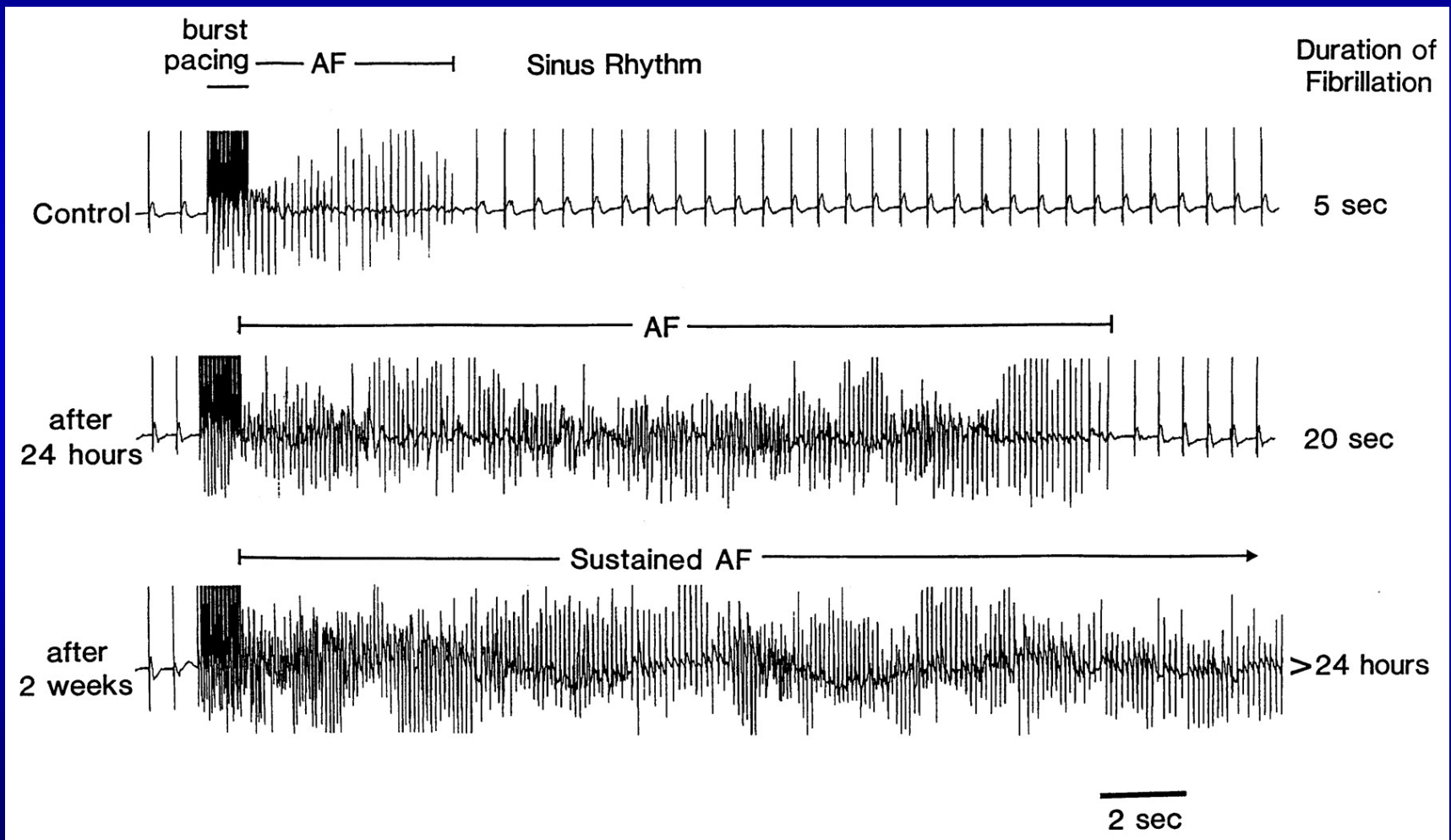
**‘Atrial Fibrillation  
Begets  
Atrial Fibrillation’**

*Prof. Giorgio Ganna 1976*

*Maurits Allessie, 1995*

# Atrial Fibrillation begets Atrial Fibrillation

## Effect of rapid atrial pacing on the duration of AF in goats



# **AF progression**

## *Different patterns*

- Atrial fibrillation recurrences under treatment
- Progression from short to long episodes
- Progression from rare to frequent episodes
- Progression from paroxysmal to permanent



# **AF progression**

## *Different patterns*

- Atrial fibrillation recurrences under treatment
- Progression from short to long episodes
- Progression from rare to frequent episodes
- Progression from paroxysmal to permanent

**Can rhythm control strategy  
(both pharmacological  
and non-pharmacological)  
prevent AF progression?**

# **Factors involved in AF progression**

**Underlying disease**

**Atrial fibrillation duration**

**Type of treatment: pharmacological  
ablation protocol**

**Physician's and patient's belief**

# Physician's and patient's belief

AF progression strongly relates to the **doctor's belief** and then the **therapeutic efforts** invested...

**Rate control – Easy way**

**Rhythm control – More challenging**



**Beta blockers**  
**Calcium channel blockers**  
**Digoxin**

**Antiarrhythmic drugs**  
**Hospitalizations for**  
**Electrical cardioversion**  
**Transcatheter ablation**



**Progression of atrial fibrillation according to  
physician's choice of  
rhythm-control vs rate-control therapy**

**Physician's choice of rate  
control increases relative  
risk of AF progression  
by 136%**

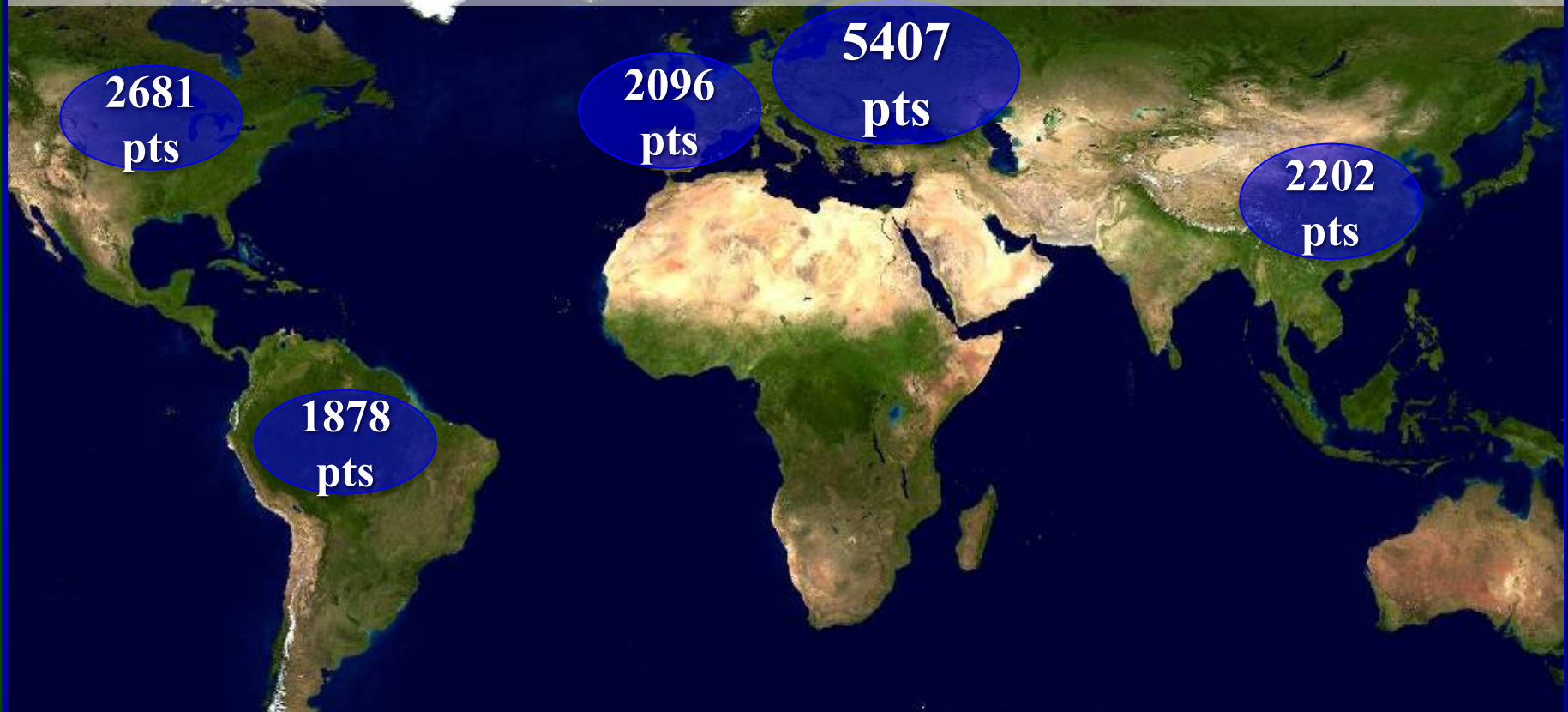
**11%**

**Permanent AF  
within 1 year**

**26%**

# ROCKET AF Trial patients enrollment – 14264 pts

## Rivaroxaban versus Warfarin in Nonvalvular Atrial Fibrillation



While the choice of anticoagulant was randomized, the choice of rhythm versus rate control was driven by

physician's belief

# Physician's choice of rhythm control

Out of 14.264 **ROCKET-AF** pts

**Persistent AF**  
**11462 (80%)**

**Paroxysmal AF**  
**2802 (20%)**



**Rhythm control**

**Rhythm control**

**1,3%**

**6,3%**

(154 pts cardioversion/ablation)

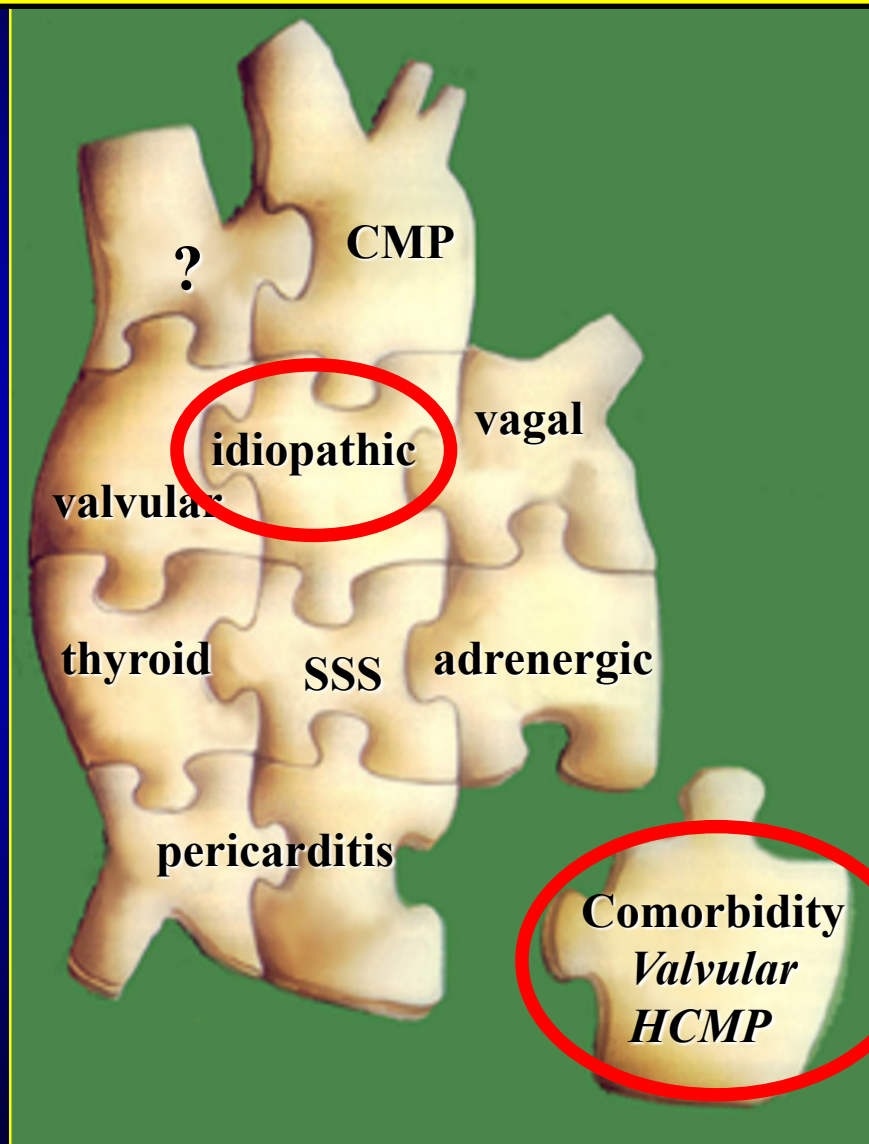
(176 pts cardioversion/ablation)

# Factors involved in AF progression

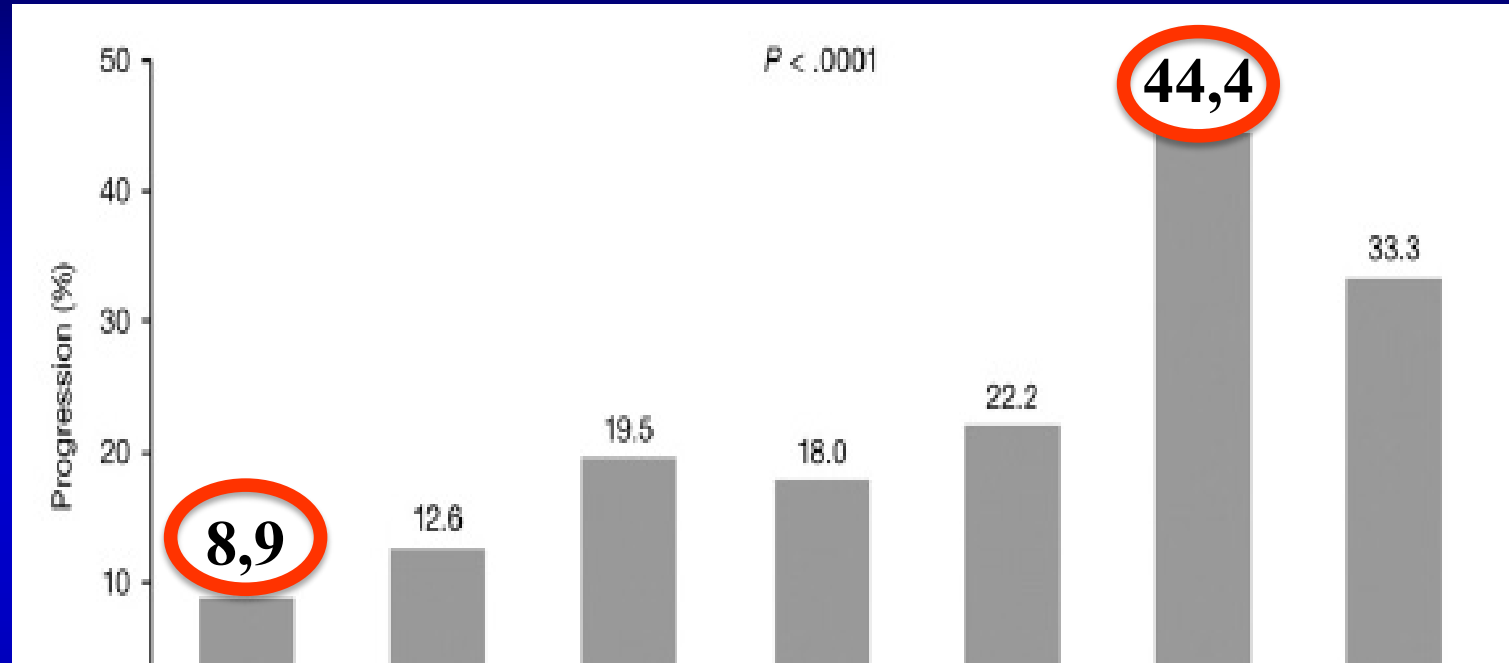
- **Underlying disease**
- Atrial fibrillation duration
- Type of treatment: ablation protocols
- Physician's and patient's belief



# Atrial Fibrillation syndrome



In pts treated with **antiarrhythmic drugs**,  
**AF progression relates to comorbidities**



**The presence of comorbidities directly increases the rate of AF progression**

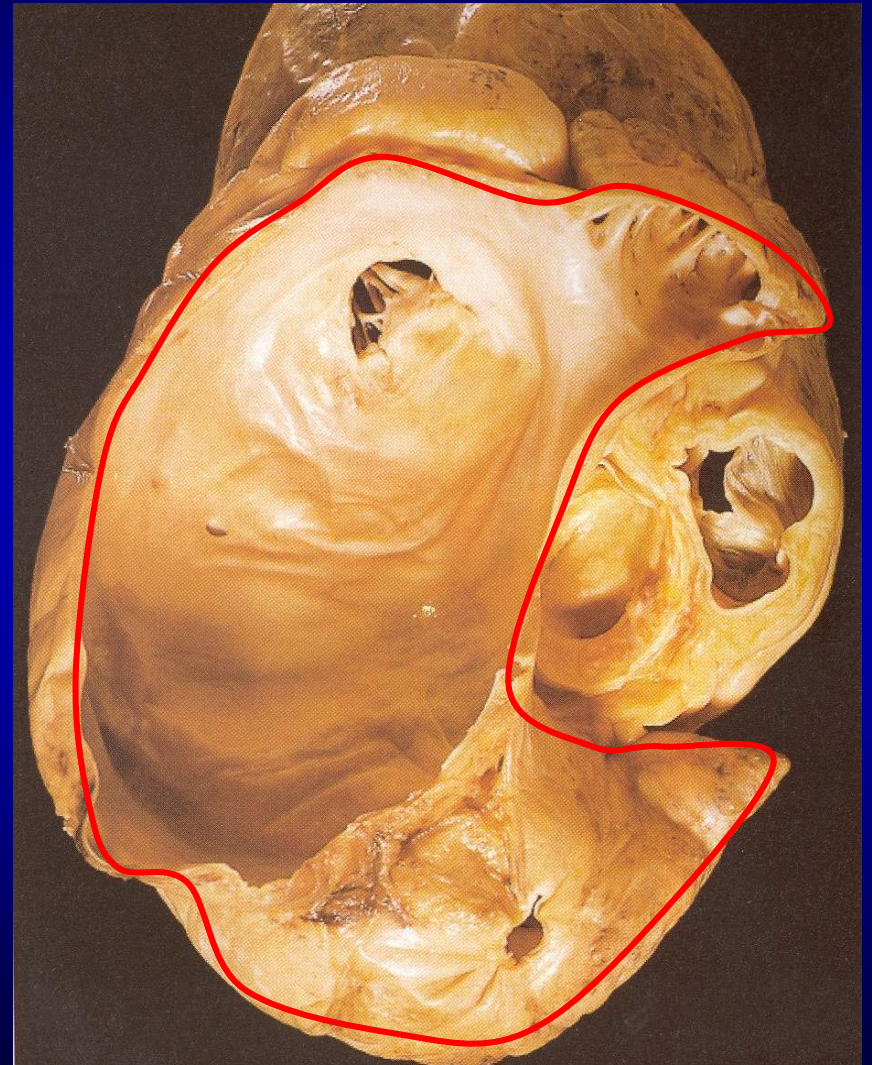
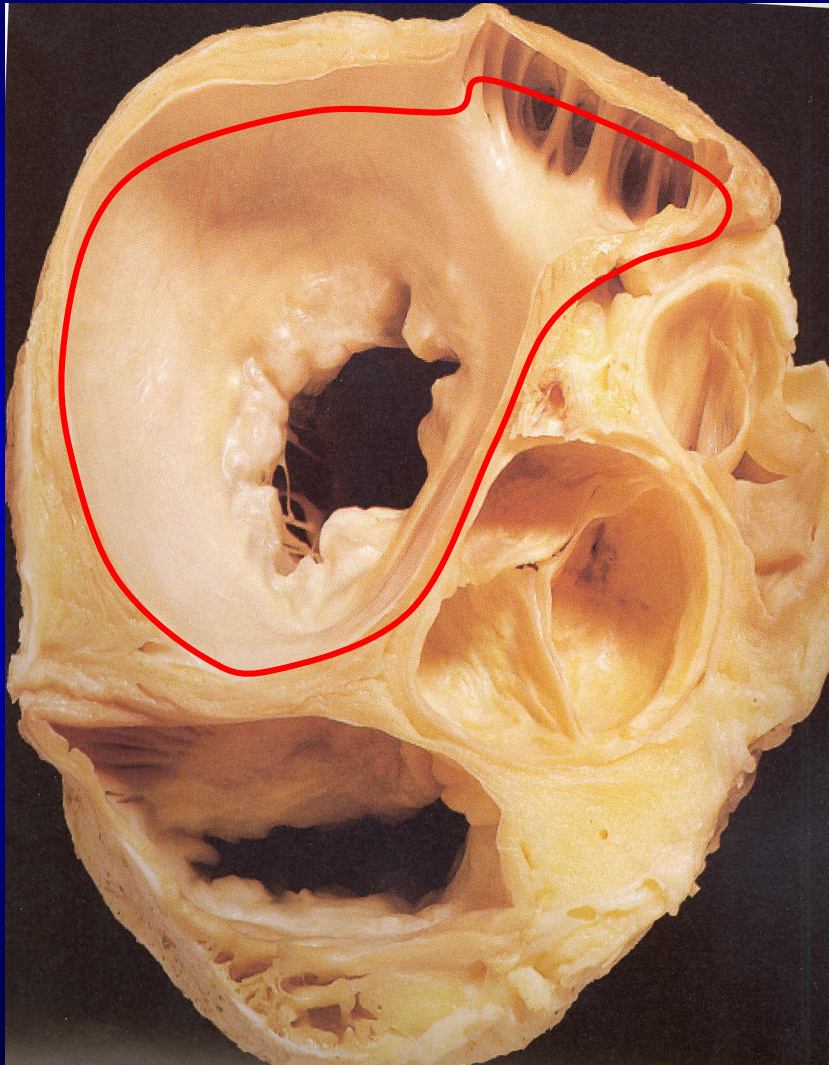
(1); C, chronic obstructive pulmonary disease (2\*); H, heart failure (1)

**HATCH score**

**RECORD-AF, De Vos, Am Heart J 2012**



# Normal vs. Dilated left atrium



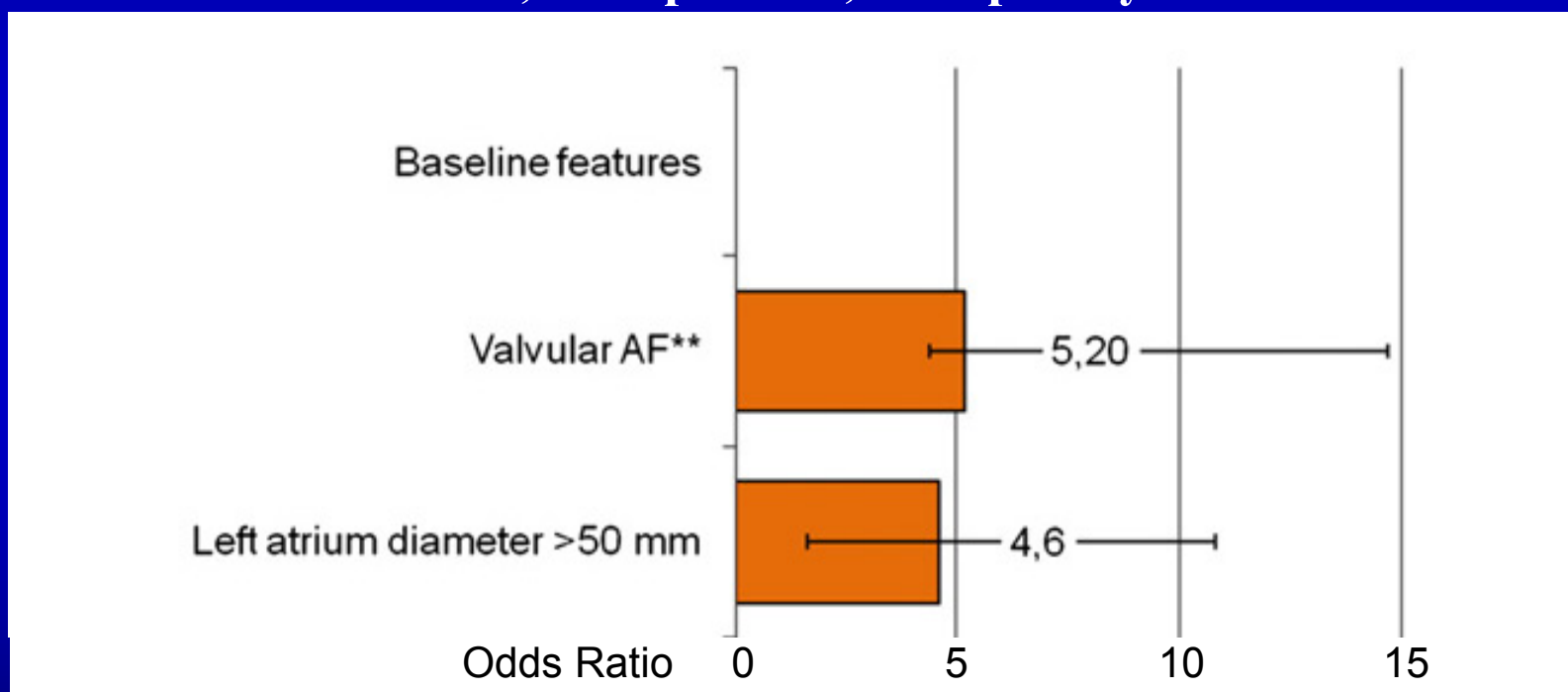


# Which are the most reliable predictors of recurrence of atrial fibrillation after transcatheter ablation? a meta-analysis

F. D'Ascenzo <sup>a,j,\*</sup>, A. Corleto <sup>a</sup>, G. Biondi-Zoccai <sup>b,j</sup>, M. Anselmino <sup>a</sup>, F. Ferraris <sup>a</sup>, L. di Biase <sup>g</sup>, A. Natale <sup>g</sup>, R.J. Hunter <sup>c</sup>, R.J. Schilling <sup>c</sup>, S. Miyazaki <sup>e</sup>, H. Tada <sup>d</sup>, K. Aonuma <sup>h</sup>, L. Yenn-Jiang <sup>f</sup>, H. Tao <sup>i</sup>, C. Ma <sup>d</sup>, D. Packer <sup>i</sup>, S. Hammill <sup>h</sup>, F. Gaita <sup>a</sup>

International Journal of Cardiology 167 (2013) 1984–1989

19 studies, 7217 patients, 60% paroxysmal AF



**Left atrium diameter and Valvular AF**  
are the two stronger predictors of AF progression



# Factors involved in AF progression

- Underlying disease

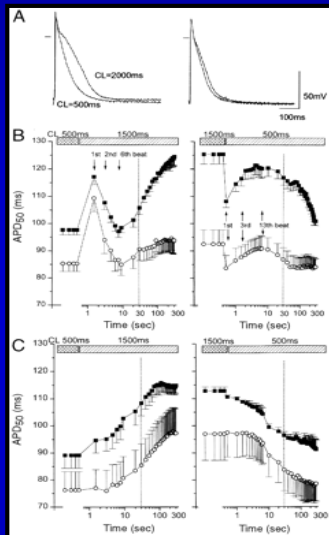
- **Atrial Fibrillation duration**

- Type of treatment: ablation protocols

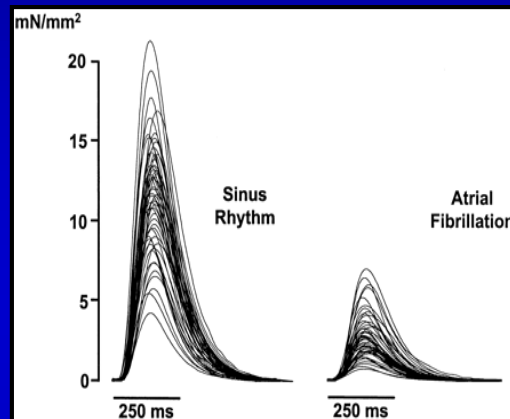
- Physician's and patient's belief

# Electrical, contractile and structural remodelling during Atrial Fibrillation

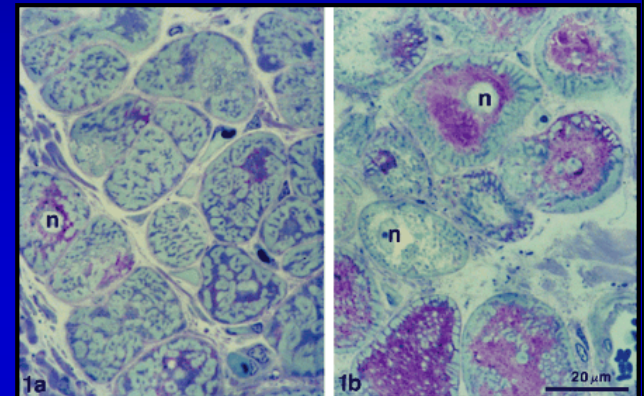
## Electrical



## Contractile



## Structural



**REVERSIBLE  
BUT TIME  
DEPENDENT**

Increased fibrosis  
and collagen

**NOT  
REVERSIBLE**

AERP shortening and  
lack of adaptation,  
reduced velocity in  
intraatrial conduction

**REVERSIBLE**

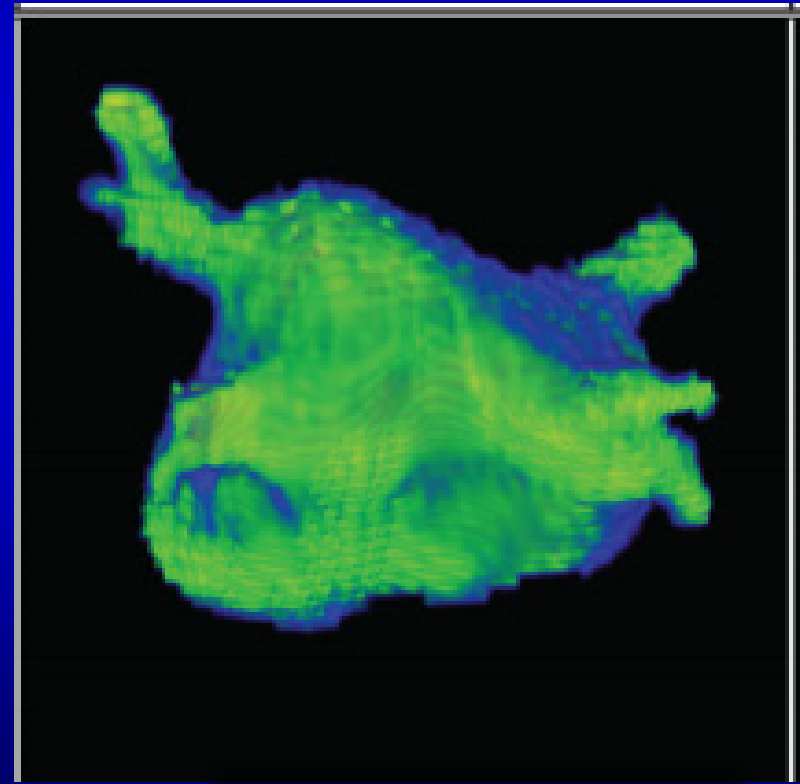
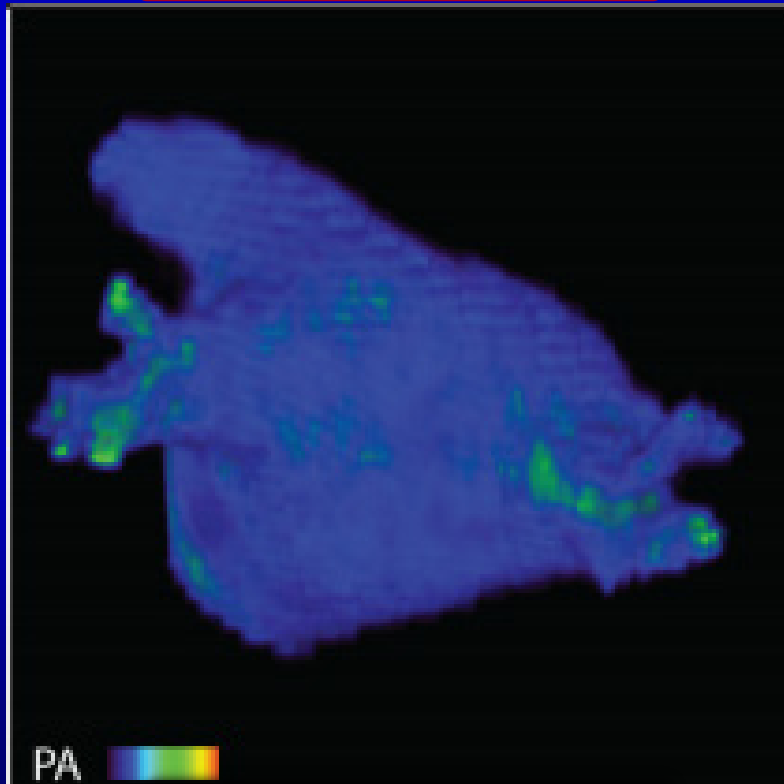
# Detection and Quantification of Left Atrial Structural Remodeling Using Delayed Enhancement MRI in Patients with Atrial Fibrillation

Robert S. Oakes et al, Circulation 2009

81 AF pts scheduled for AF ablation underwent 3D DE-MRI

**Paroxysmal AF**

**Persistent AF**



**Mild fibrosis**

**Extensive fibrosis**

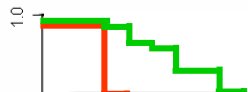
# Long-Term Clinical Results of 2 Different Ablation Strategies in Patients With Paroxysmal and Persistent Atrial Fibrillation

Fiorenzo Gaita, MD; Domenico Caponi, MD; Marco Scaglione, MD; Antonio Montefusco, MD; Antonella Corleto, MD; Fernando Di Monte, PhD; Daniele Coin, PhD; Paolo Di Donna, MD; Carla Giustetto, MD

CIRCULATION Arrhythmia Electrophysiol. 2008;1:269-275

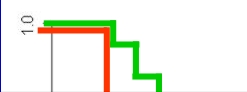
**Paroxysmal AF**

**Persistent/long standing AF**



85%

85%



**Structural remodelling impacts on long-term progression (recurrences) following transcatheter ablation**



# AF duration relates to post ablation AF progression

Long-term single- and multiple-procedure outcome and predictors of success after catheter ablation for persistent

***AF duration > 6 months  
risk of recurrences ↑ 42-64%***

From **paroxysmal-persistent atrial fibrillation** *J Cardiovasc Med* 11:593-598

Antonio Montefusco, Luigi Biasco, Alessandro Blandino, Yvonne Cristoforetti,

## **Five-Year Outcome of Catheter Ablation of Persistent Atrial Fibrillation Using Termination of Atrial Fibrillation as a Procedural Endpoint**

*(Circ Arrhythm Electrophysiol. 2015;8:18-24.*

Daniel Scherr, MD; Paul Khairy, MD, PhD; Shinsuke Miyazaki, MD;  
Valerie Aurillac-Lavignolle, BSc; Patrizio Pascale, MD; Stephen B. Wilton, MD;  
Khaled Ramoul, MD; Yuki Komatsu, MD; Laurent Roten, MD; Amir Jadidi, MD;  
Nick Linton, MD, PhD; Michala Pedersen, MD; Matthew Daly, MD; Mark O'Neill, MD;  
Sebastien Knecht, MD, PhD; Rukshen Weerasooriya, MD; Thomas Rostock, MD;  
Martin Manninger, MD; Hubert Cochet, MD; Ashok J. Shah, MD; Sunthareth Yeim, MD;  
Arnaud Denis, MD; Nicolas Derval, MD; Meleze Hocini, MD; Frederic Sacher, MD;  
Michel Haïssaguerre, MD; Pierre Jais, MD

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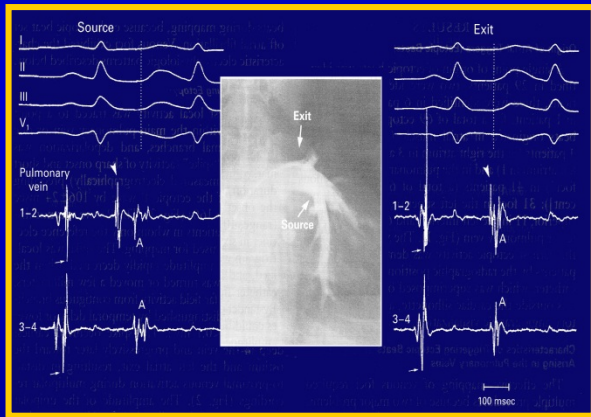
# Factors involved in AF progression

- Underlying disease
- Atrial fibrillation duration
- **Type of treatment: ablation protocols**
- Physician's and patient's belief

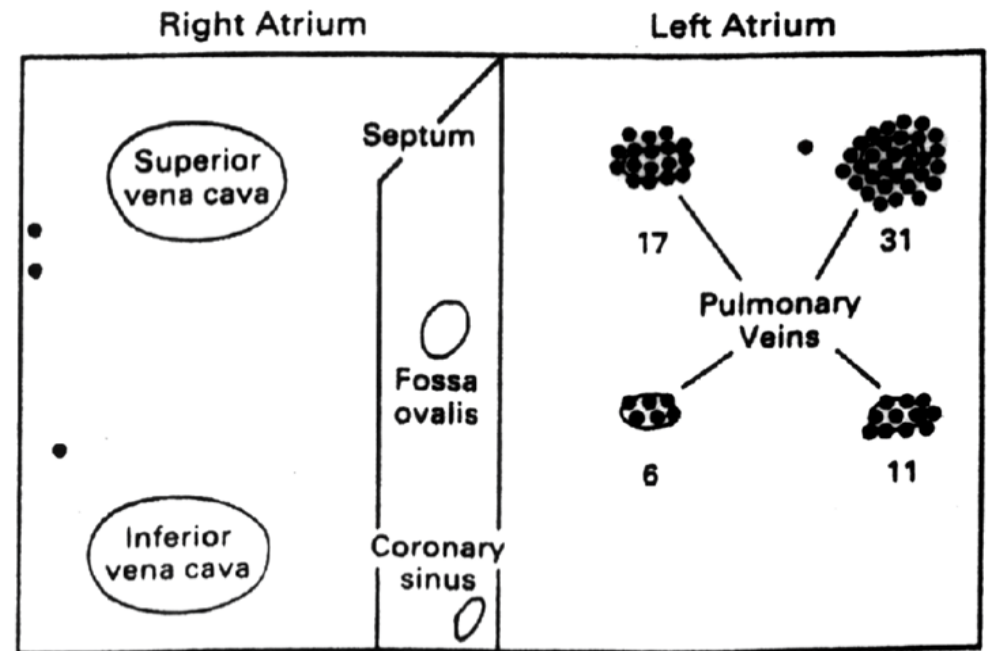
# Cornerstone of AF ablation

## SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

MICHEL HAÏSSAGUERRE, M.D., PIERRE JAÏS, M.D., DIPEN C. SHAH, M.D., ATSUSHI TAKAHASHI, M.D., MÉLÈZE HOCINI, M.D., GILLES QUINIOU, M.D., STÉPHANE GARRIGUE, M.D., ALAIN LE MOUROUX, M.D., PHILIPPE LE MÉTAYER, M.D., AND JACQUES CLÉMENTY, M.D. **NEJM 1998;339:659-666**



**45 pts with  
idiopathic PAF  
Follow-up:  
8±6 months**



**62%** success rate w/oAAD

Is pulmonary vein isolation alone  
enough to treat also patients with  
atrial remodelling related to  
**persistent and long-standing AF?**



# Linear Cryoablation of the Left Atrium Versus Pulmonary Vein Cryoisolation in Patients With Permanent Atrial Fibrillation and Valvular Heart Disease

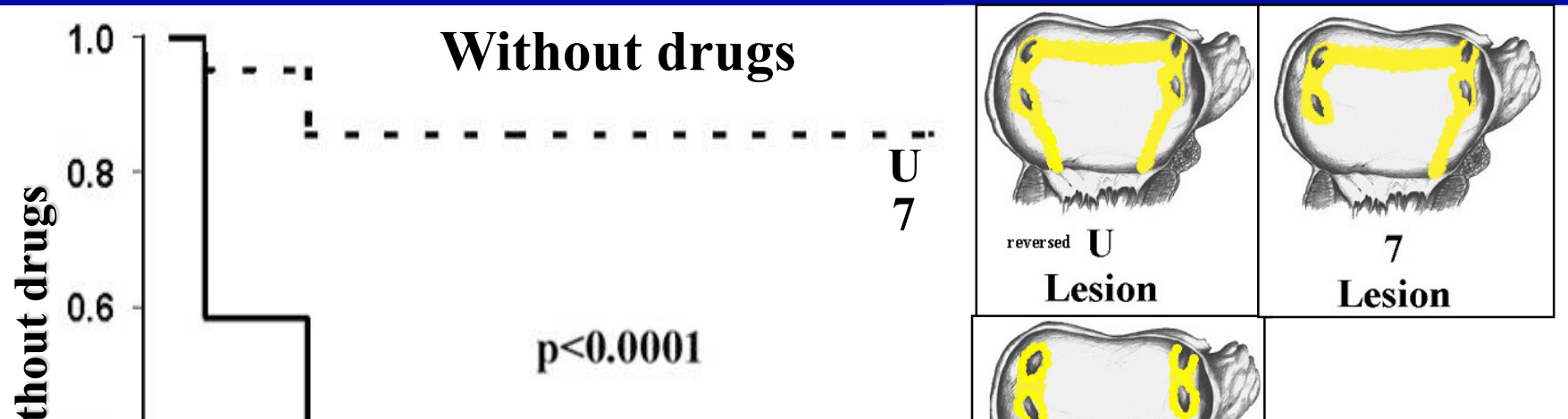
Circulation

2005;111:136-42

## Correlation of Electroanatomic Mapping and Long-Term Clinical Results

Permanent AF  
and Valvular  
Heart Disease

Fiorenzo Gaita, MD; Riccardo Ricciardi, MD; Domenico Caponi, MD; Dipen Shah, MD;  
Lucia Garberoglio, MD; Laura Vivalda, MD; Alessandro Dulio, BS; Andrea Chiecchio, PhD;  
Eric Manasse, MD; Roberto Gallotti, MD

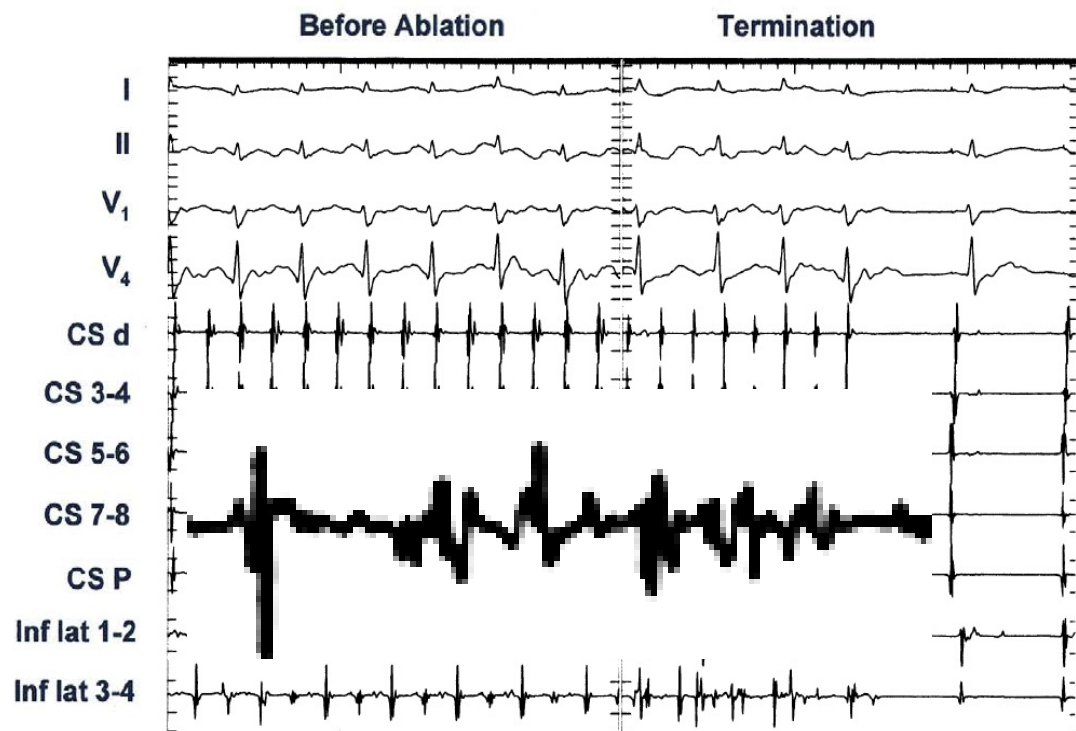
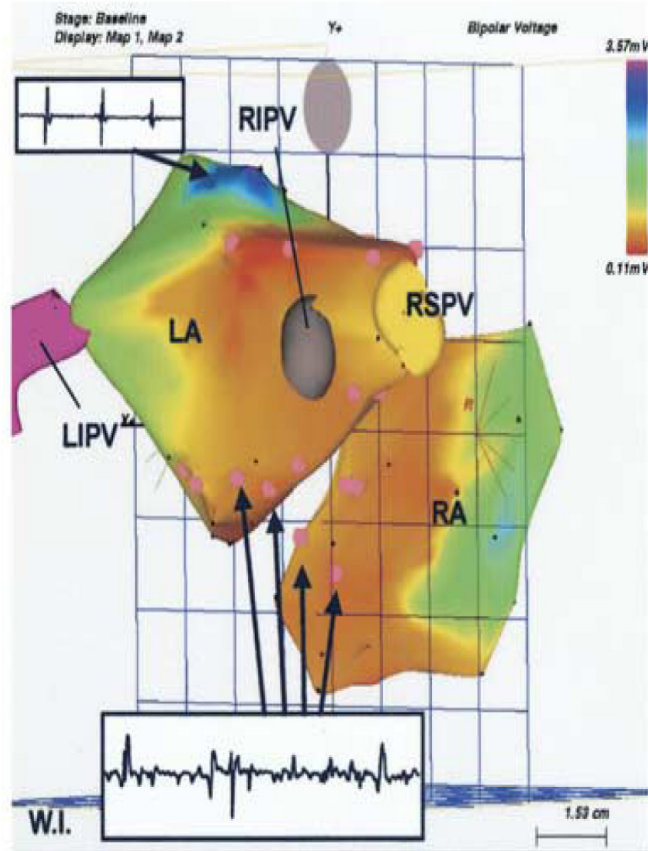


For Long Standing Atrial Fibrillation  
PV isolation alone is not sufficient:  
we have to add **substrate modification**  
**with linear lesions or fragmented potentials**

# A New Approach for Catheter Ablation of Atrial Fibrillation: Mapping of the Electrophysiologic Substrate

Koonlawee Nademanee, MD, FACC,\* John McKenzie, MD,\* Erol Kosar, MD,\* Mark Schwab, MD,\*  
Buncha Sunsaneewitayakul, MD,† Thaveekiat Vasavakul, MD,\* Chotikorn Khunnawat, MD,\*  
Tachapong Ngarmukos, MD‡ (J Am Coll Cardiol 2004;43:2044-53)

**121 pts with refractory AF (57 PAF, 64 chronic). F-U: 1 y**



**84%** success rate w/out AAD (16% redo)

# Different patterns of AF progression

- Atrial fibrillation relapses
- Progression from short to long episodes
- Progression from rare to frequent episodes
- Progression from paroxysmal to permanent

# Long-term progression from paroxysmal to permanent atrial fibrillation following transcatheter ablation in a large single-center experience

Marco Scaglione, MD,<sup>\*</sup> Cristina Gallo, MD,<sup>†</sup> Alberto Battaglia, MD,<sup>†</sup> Davide Sardi, MD,<sup>\*</sup> Luca Gaido, MD,<sup>†</sup> Matteo Anselmino, MD,<sup>†</sup> Lucia Garberoglio, MD,<sup>†</sup> Carla Giustetto, MD,<sup>†</sup> Davide Castagno, MD,<sup>†</sup> Federico Ferraris, MD,<sup>†</sup> Elisabetta Toso, MD,<sup>\*</sup> Fiorenzo Gaita, MD<sup>†</sup>

*From the <sup>\*</sup>Division of Cardiology, Department of Internal Medicine, Cardinal Massaia Hospital, Asti, Italy, and <sup>†</sup>Division of Cardiology, Department of Medical Sciences, San Giovanni Battista Hospital, University of Turin, Turin, Italy.*

**889 patients referred for AF ablation  
between 2005-2007**

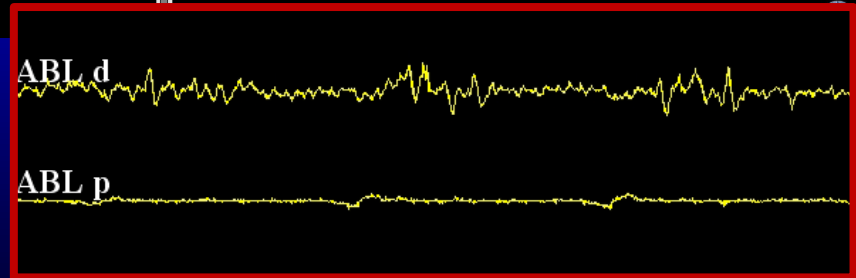
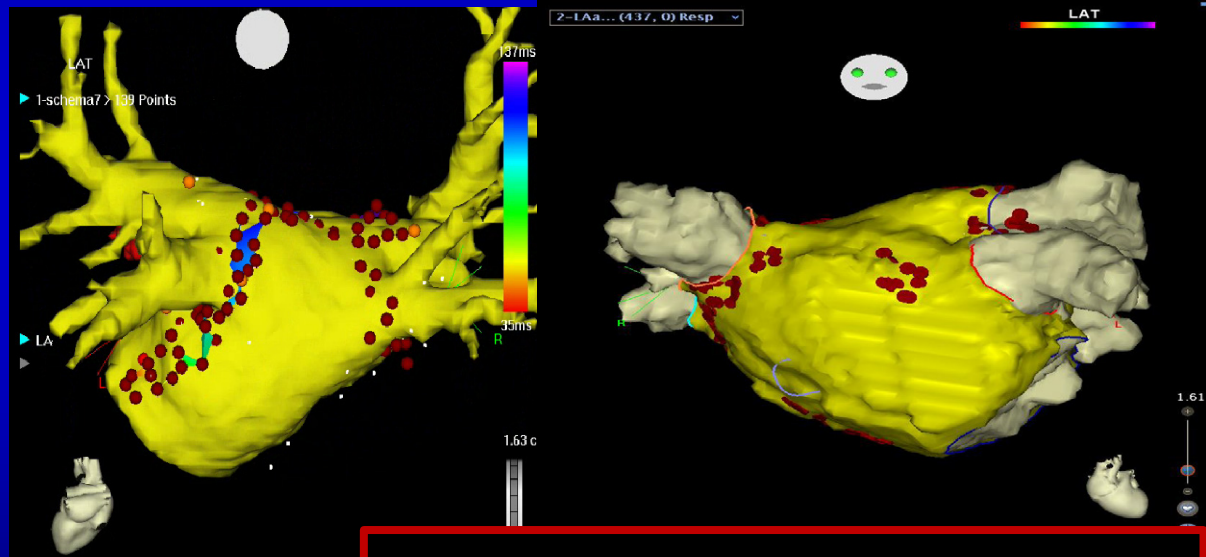
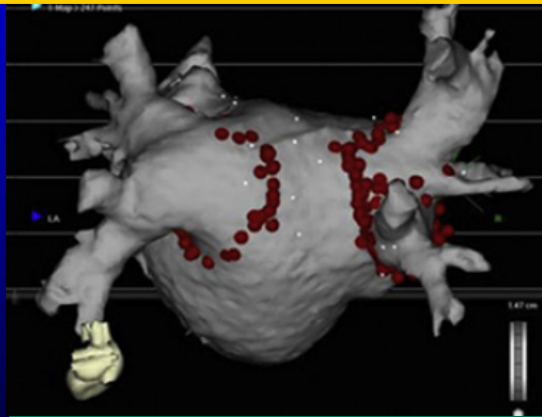
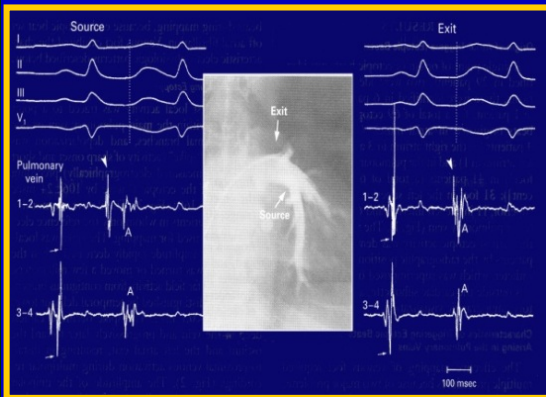
**Minimum Follow up 5 years**



# AF ablation protocol

**PAROXYSMAL  
PV Isolation**

**PERSISTENT and LONG-STANDING  
PVI + CFAE + Linear Lesions**



# Influence of AF duration on progression from paroxysmal to permanent AF

**889 patients** referred for AF ablation

474 (53.3%)  
paroxysmal AF

360 (40.5%)  
persistent AF

55 (6.2%)  
long standing  
persistent AF

**Progression to perm AF 5 years**

**2.7%**

**10%**

**14.5%**

# Influence of AF duration on progression from paroxysmal to permanent AF

**889 patients** referred for AF ablation

474 (53.3%)  
paroxysmal AF

Permanent AF  
5 years

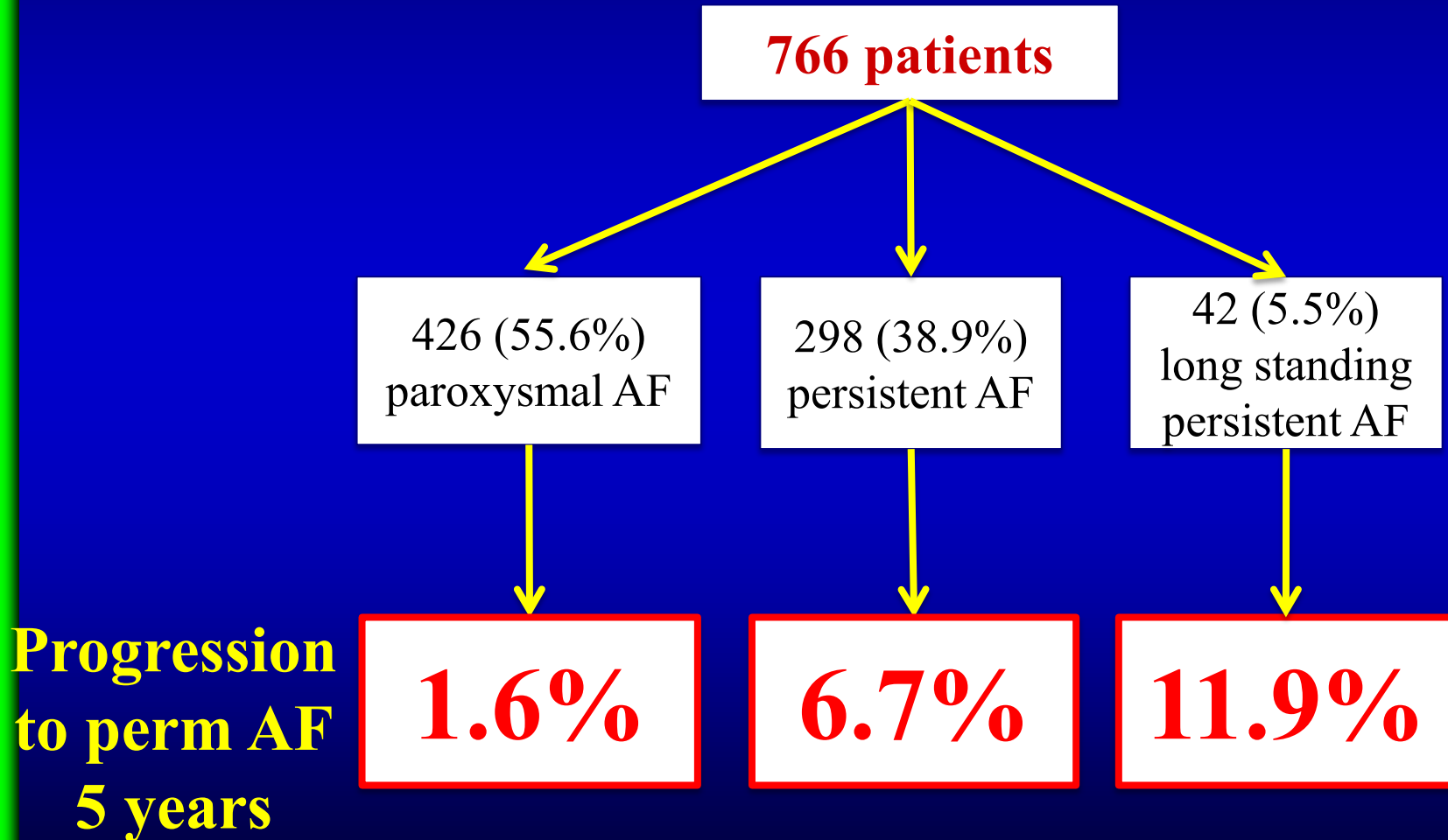
**2.7%**

RECORD AF Survey  
rhythm control strategy with  
**antiarrhythmic drug**  
treatment

1542 paroxysmal AF pts

**11%**  
Permanent AF at  
1 year

# Influence of AF duration on progression in pts w/o structural heart disease





# Influence of AF duration on progression in pts with structural heart disease

**123 patients**  
(44 HCM. 79 valv)

48 (39.0%)  
paroxysmal AF

62 (50.4%)  
persistent AF

13 (10.6%)  
long standing  
persistent AF

**Progression  
to perm AF  
5 years**

**12.5%**

**25.8%**

**23.1%**

# Conclusions

**AF ablation can reduce AF progression**

**Results are impressive in patients  
without structural heart disease**

**In case of structural heart disease, AF progression  
may be prevented in up to 75% of the cases**

**In both cases transcatheter ablation should be  
performed before structural remodelling related to  
AF duration occur**

**Thanks for your attention**

