

Roma, 30 /9/ 2022

My top ten rules in AF ablation

Prof. Fiorenzo Gaita

University of Turin

J Medical



Ideological Disclosures

If the Good Lord (or natural evolution)
gave us Sinus Rhythm and not Atrial
Fibrillation there must be a reason.

Mechanisms of AF

Substrate

ATRIUM

Anatomical:

Atrial Dilatation,
Fibrosis,
Hypertrophy,

Loss of connecting protein,
intraatrial conduction delay,

Electrophysiological:

Short ERP,
ERP dispersion,
lack of ERP rate adaptation.
functional conduction block.

Trigger

APC, P/T,
long-short cycle

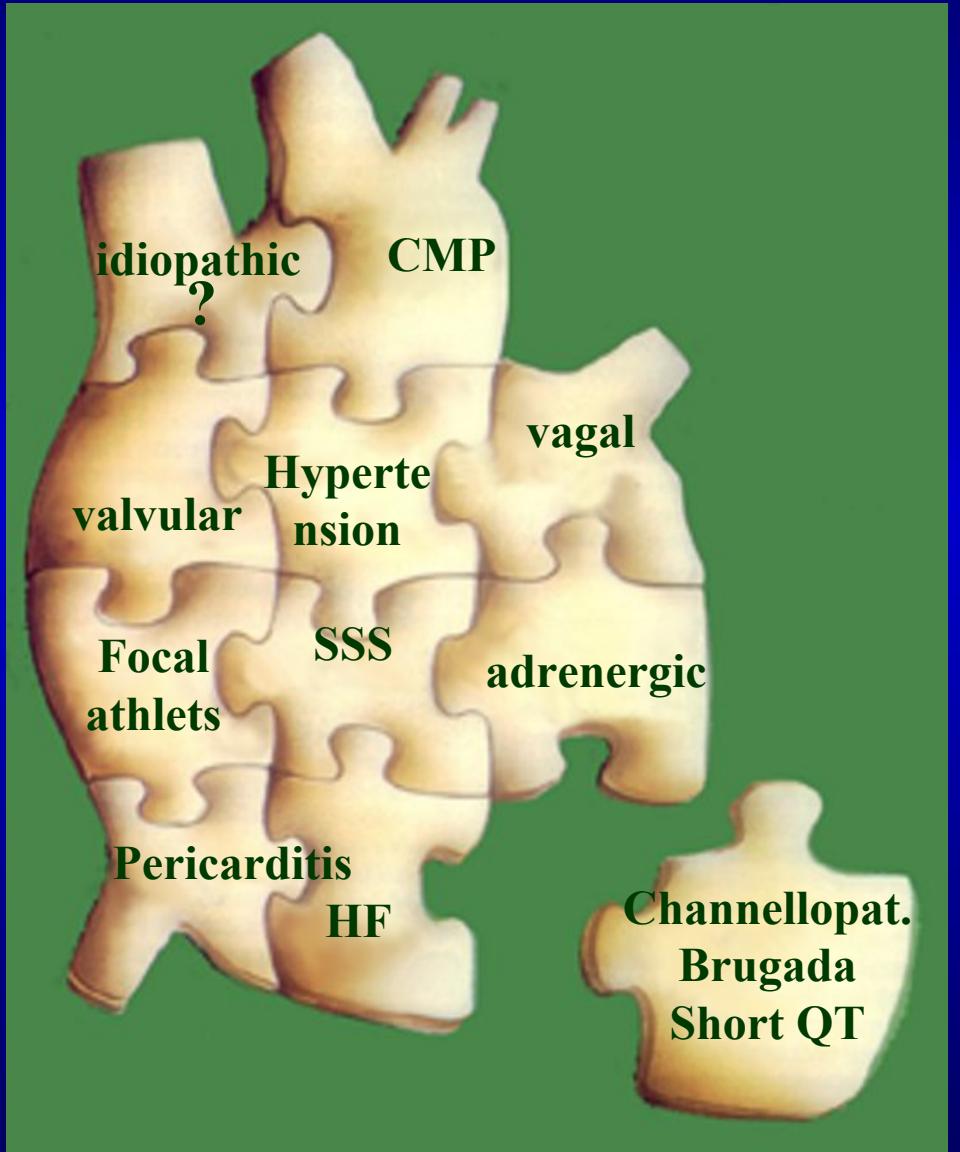
AF

Catalytic

Autonomic Nervous System
vagal /Adrenergic , Drugs

Heterogeneous Substrate of AF

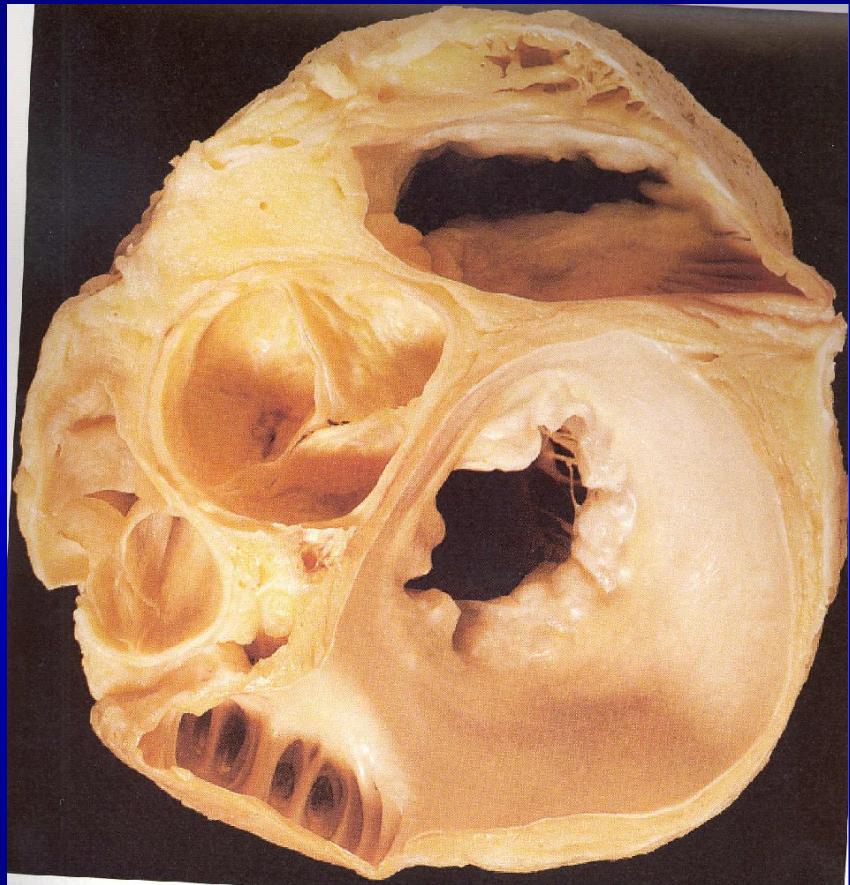
#2



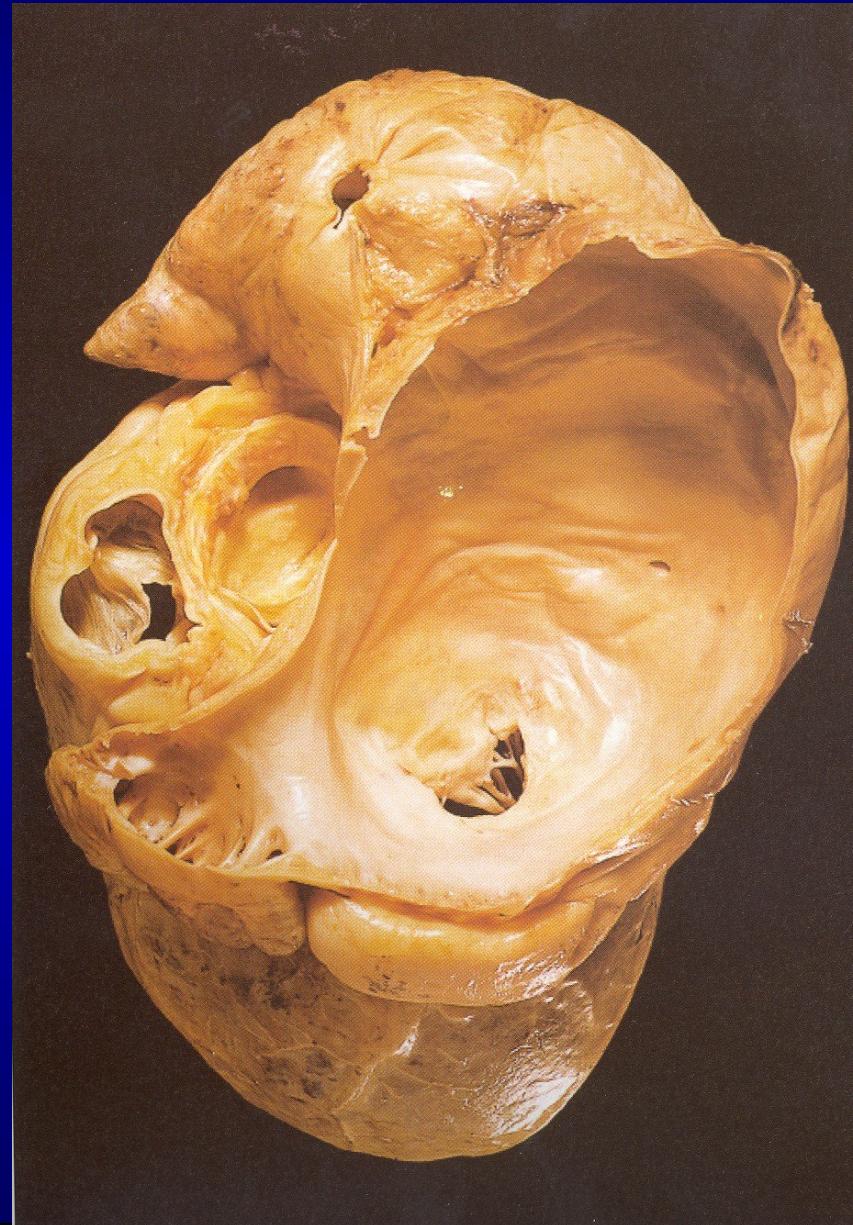
The Atrial Fibrillation

The Atrial
FibrillationS

Normal heart



Mitral stenosis

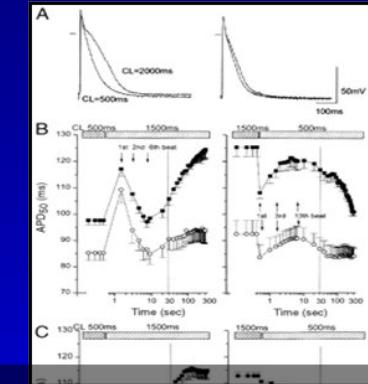
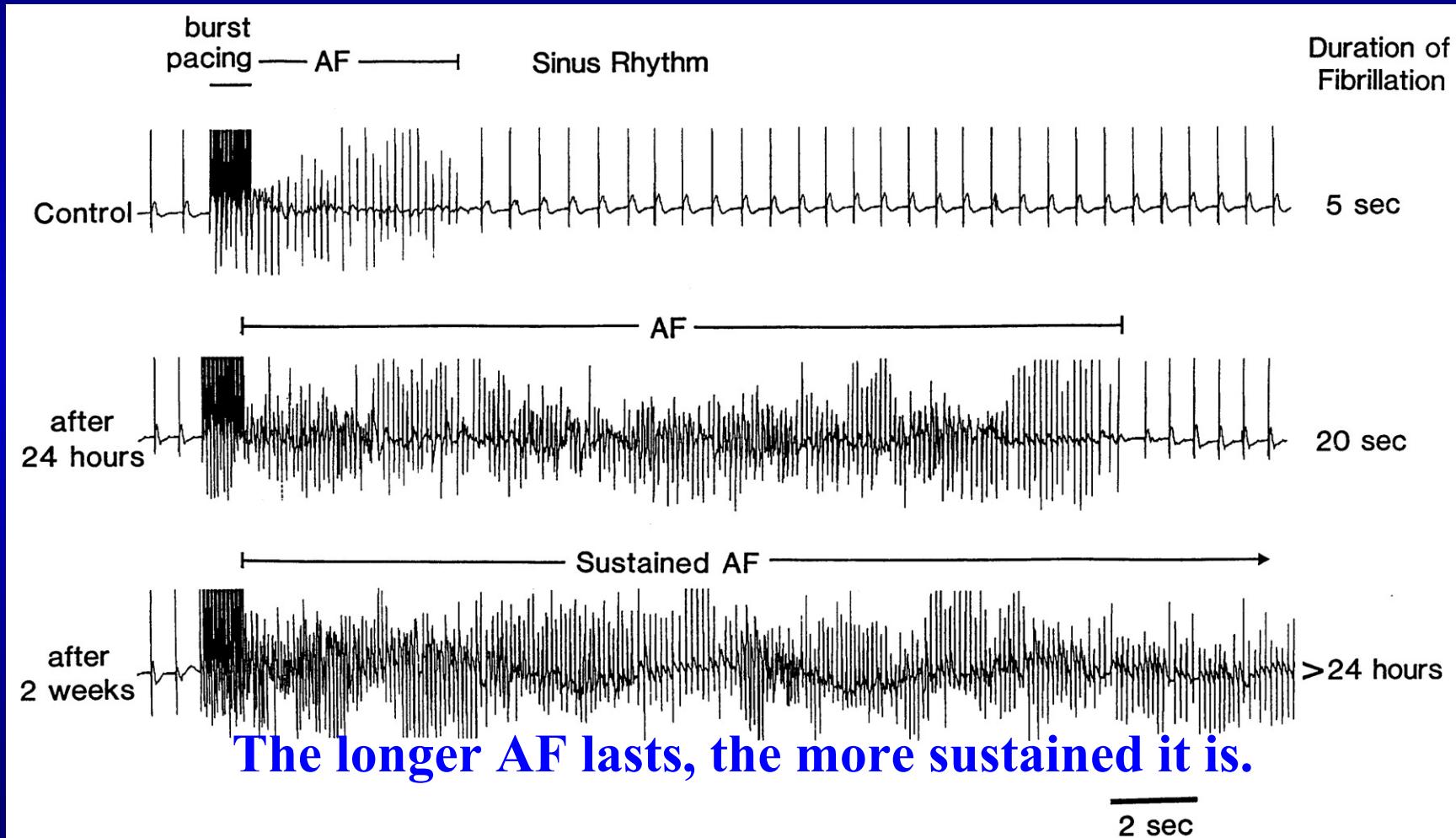


Courtesy of Anton Becker

AF begets AF
and modifying the substrate
AF sustains AF

AF begets AF

#3

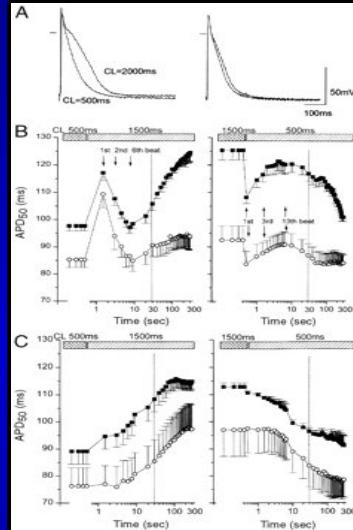


AERP shortening and
lack of adaptation,

REVERSIBLE

Electrical, Contractile and Structural remodelling during Atrial Fibrillation

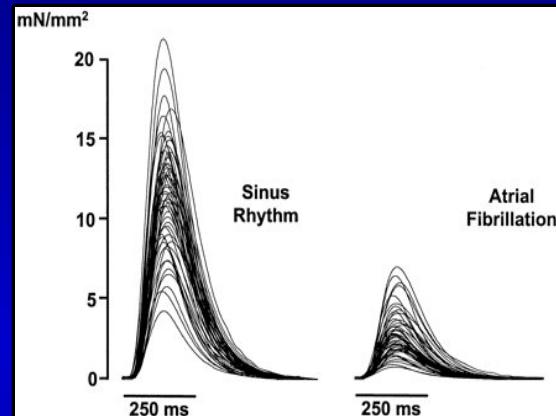
Electrical



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

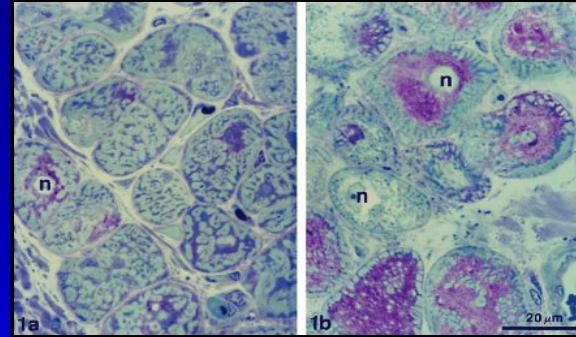
REVERSIBLE

Contractile



**REVERSIBLE
BUT TIME
DEPENDENT**

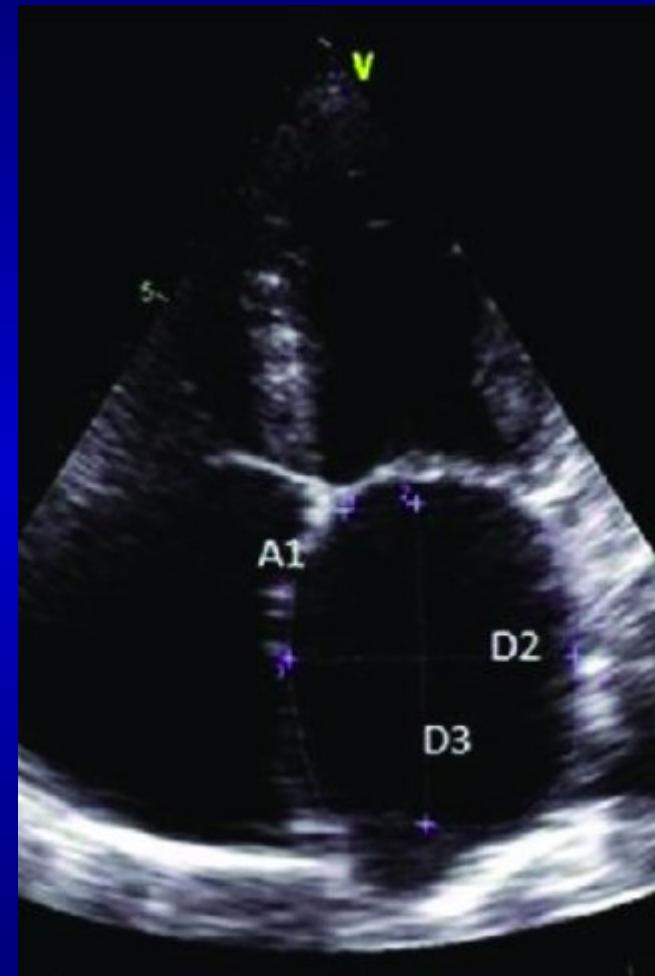
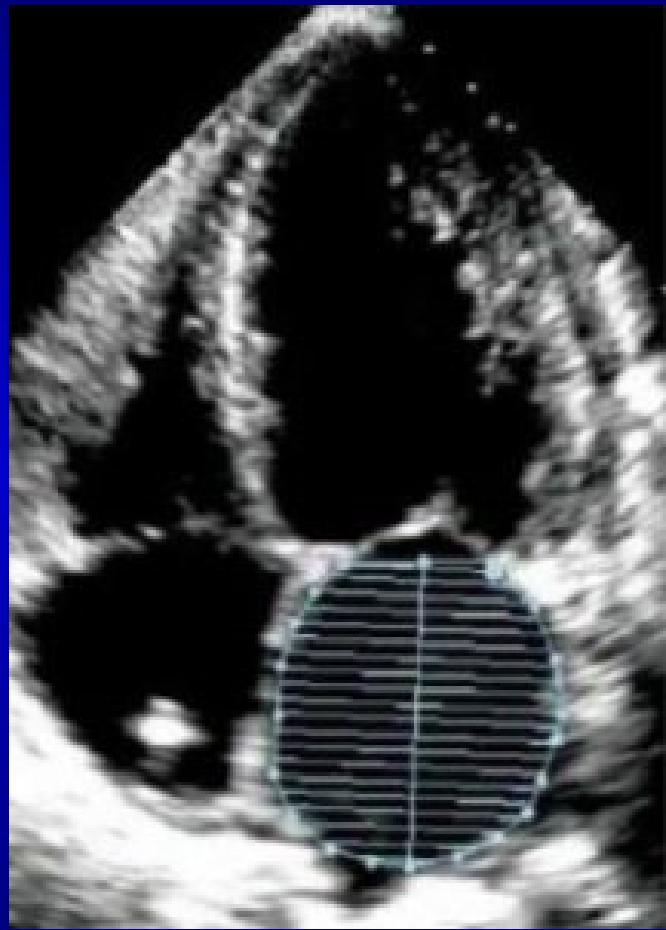
Structural



Fibrosis, increase of collagen

**NOT
COMPLETELY
REVERSIBLE**

Adapted from Allessie M et al. Cardiovasc Res 2002

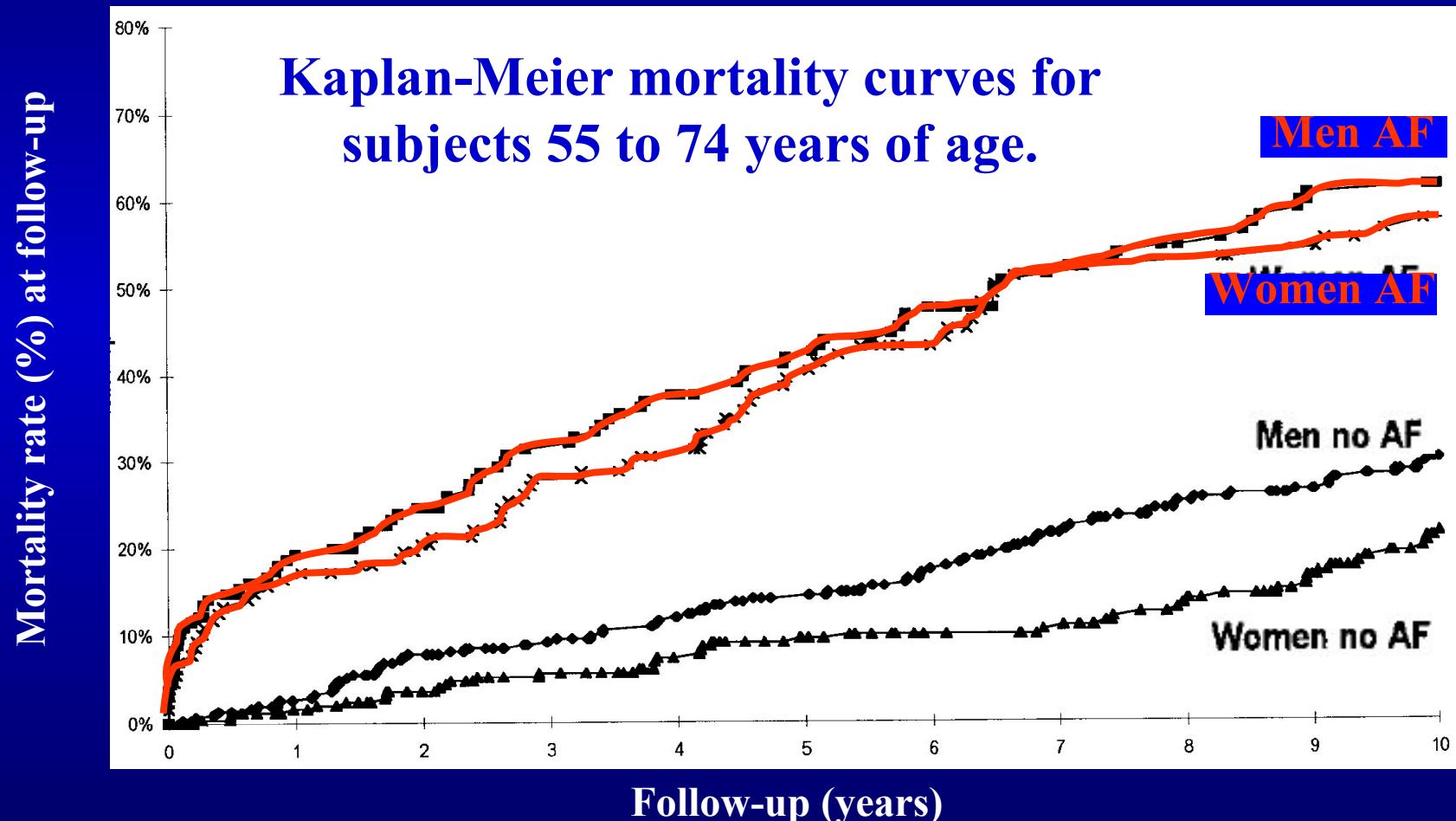


AF is not a benign arrhythmia

Increases risk of symptoms worsening,
hospitalizations, stroke and death

AF and risk of death

5209 patients in the Framingham Study



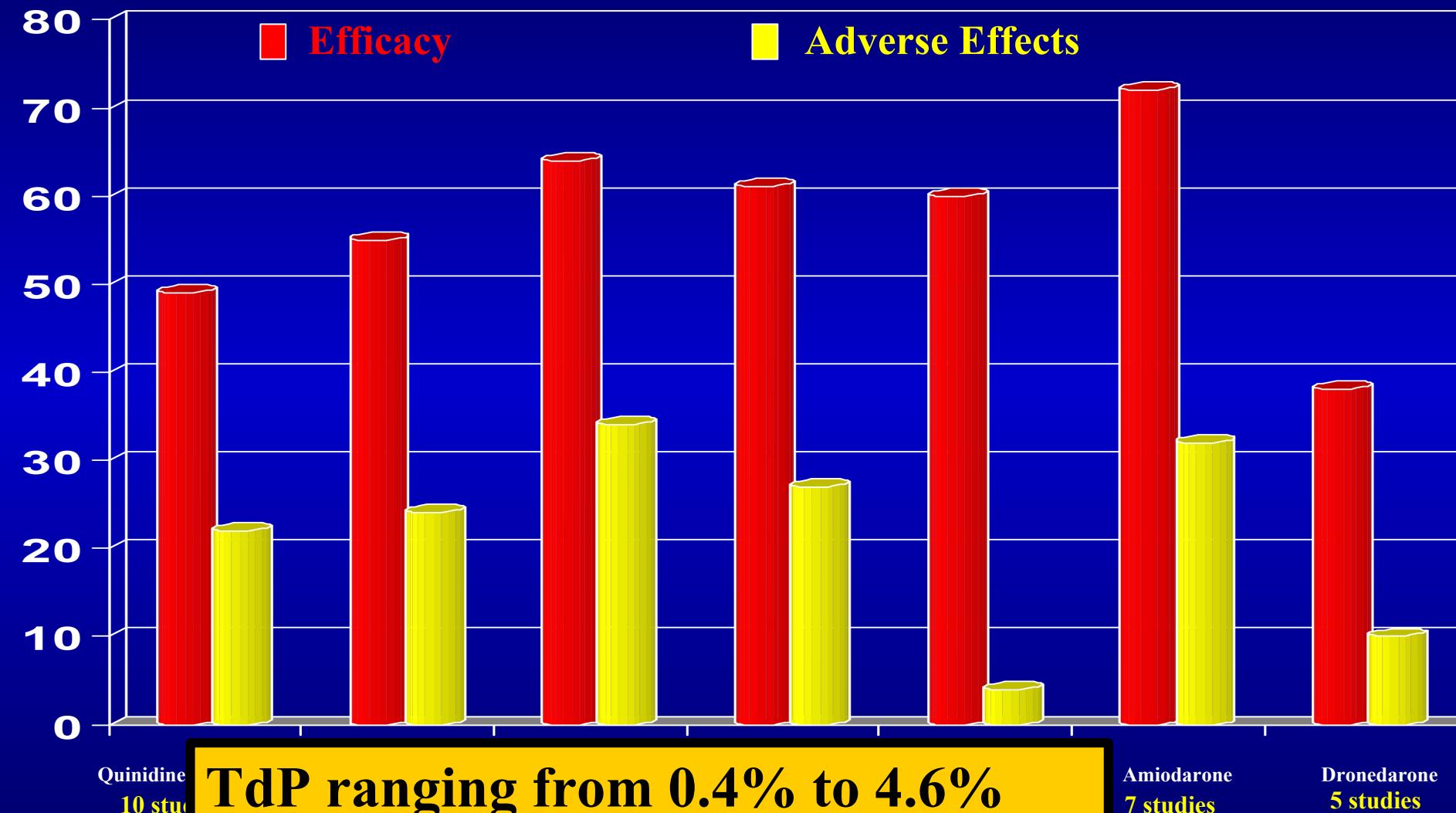
Keep in mind the
Aims of AF management

Symptoms relief and ↑ exercise tolerance

Reduction hospitalizations and morbidity
(not only stroke)

Reduction of mortality

Revision of literature: AAD for AF (~1 y FU)



AAD

(Rhythm control)

vs.

Beta-blocker

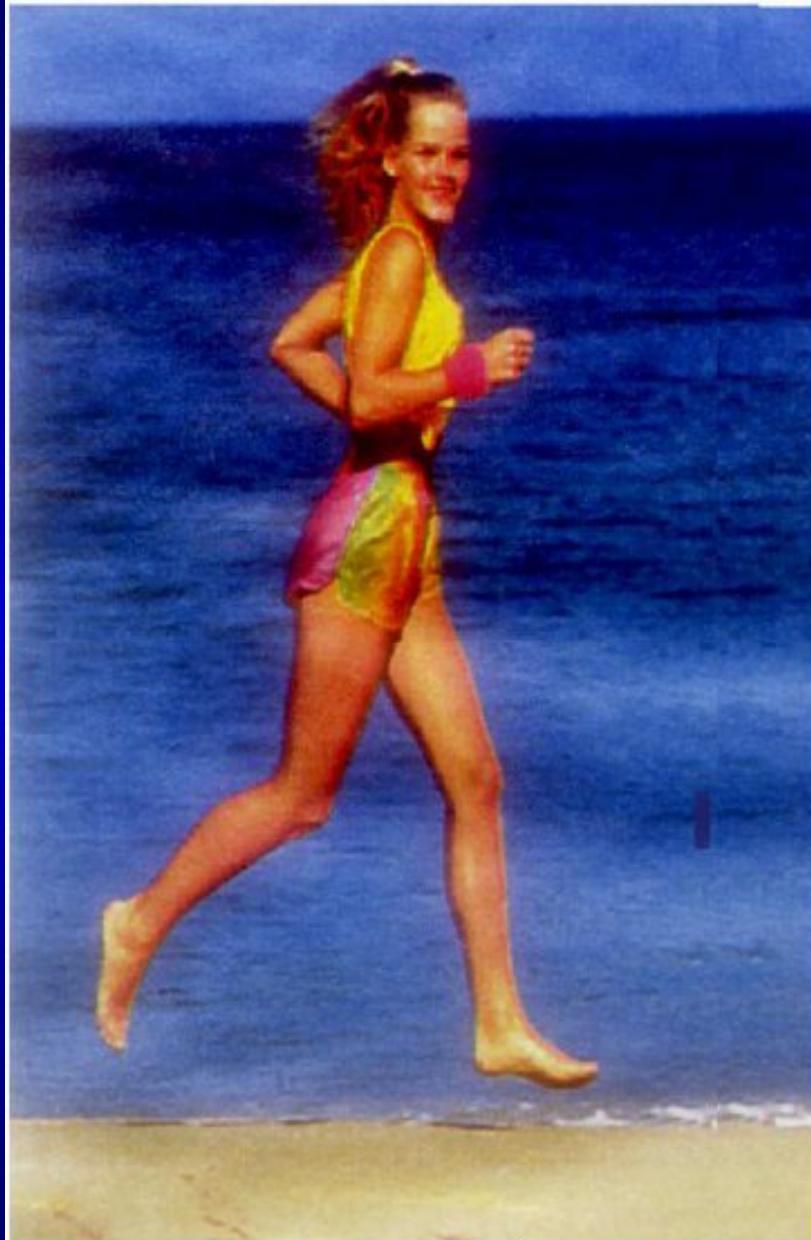
(Rate control)

Trial	Inclusion criteria	Primary outcome Parameter	Patients reaching primary outcome (n)		
			Rate ctrl	Rhytm ctrl	P
PIAF (2000) 252 Patients	Persistent AF (7-360 days)	Symptomatic improvement	76/125 (60.8%)	70/127 (55.1%)	0.32
AFFIRM (2002) 4060 Patients	Paroxysmal AF or persistent AF, age ≥65 years, or risk of stroke >10%	All-cause mortality	310/2027 (25.9%)	356/2033 (26.7%)	0.08
RACE (2002) 522 Patients	Persistent AF or flutter for <1 year and 1-2 cardioembolic events and/or antiarrhythmics	Composite: cardiovascular death, CHF, severe bleeding, pacemaker implantation, thrombo-embolic events, severe adverse effects of antiarrhyth. drugs	44/256 (17.2%)	60/266 (22.6%)	0.11
STAF (2003) 200 Patients	Persistent AF (>4 weeks and <2 years), LA size >45 mm, CHF NYHA II-IV, LVEF <45%	Composite: overall mortality, cerebrovascular complications, CHF, arrhythmic events	10/100 (10.0%)	9/100 (9.0%)	0.99
HOT CAFÈ (2004) 205 Patients	First clinically overt persistent AF (≥7 days and <2 years), age 50-75 years	Composite: death, thrombo-embolic events; intracranial/major haemorrhage	1/101 (1.0%)	4/104 (3.9%)	>0.71
AF-CHF (2008) 1376 Patients	LVEF ≤35%, symptoms of CHF, history of AF (≥6 h or DCC <last 6 months)	Cardiovascular death	175/1376 (25%)	182/1376 (27%)	0.59
PRIMUM (2009)		Composite of total mortality, symptomatic cerebral infarction, and all-cause hospitalization	33/337 (10%)	34/339 (10%)	0.99

No difference in mortality
in Rhythm Control patients
(using antiarrhythmic drugs)

#6

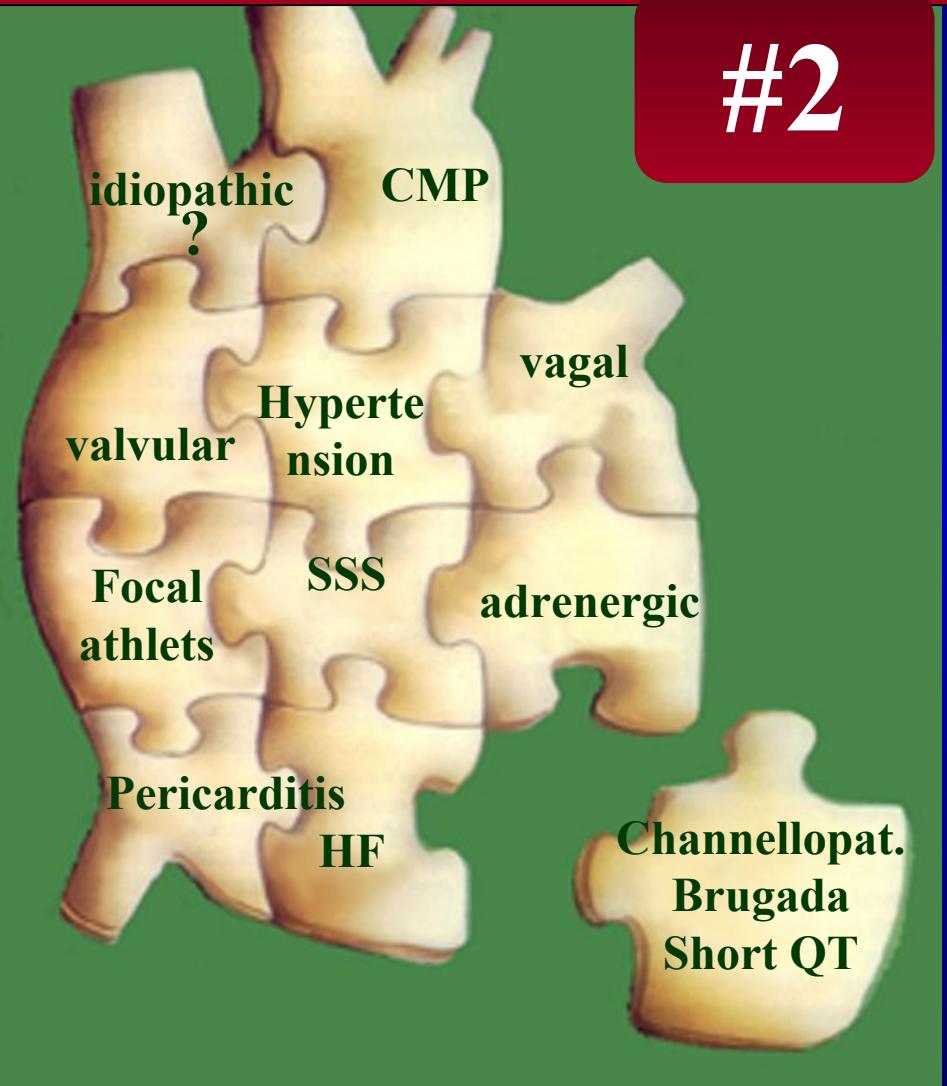
Pharmacological antiarrhythmic therapy
improves QoL, reduces hospitalizations
but does not affect survival



AF
Ablation

The Atrial Fibrillation S

#2



AF Ablation
Different AF
Different
Ablation strategy



Associated to structural heart disease:

- Valvular heart disease (mitral)
- Coronary artery disease
- Systemic hypertension * * *
- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Congenital cardiomyopathy (septum)
- Cardiomyopathy restrictive
- Cardiac tumors
- Pericarditis
- Age

“Lone atrial fibrillation” ?

Atrial Fibrillation

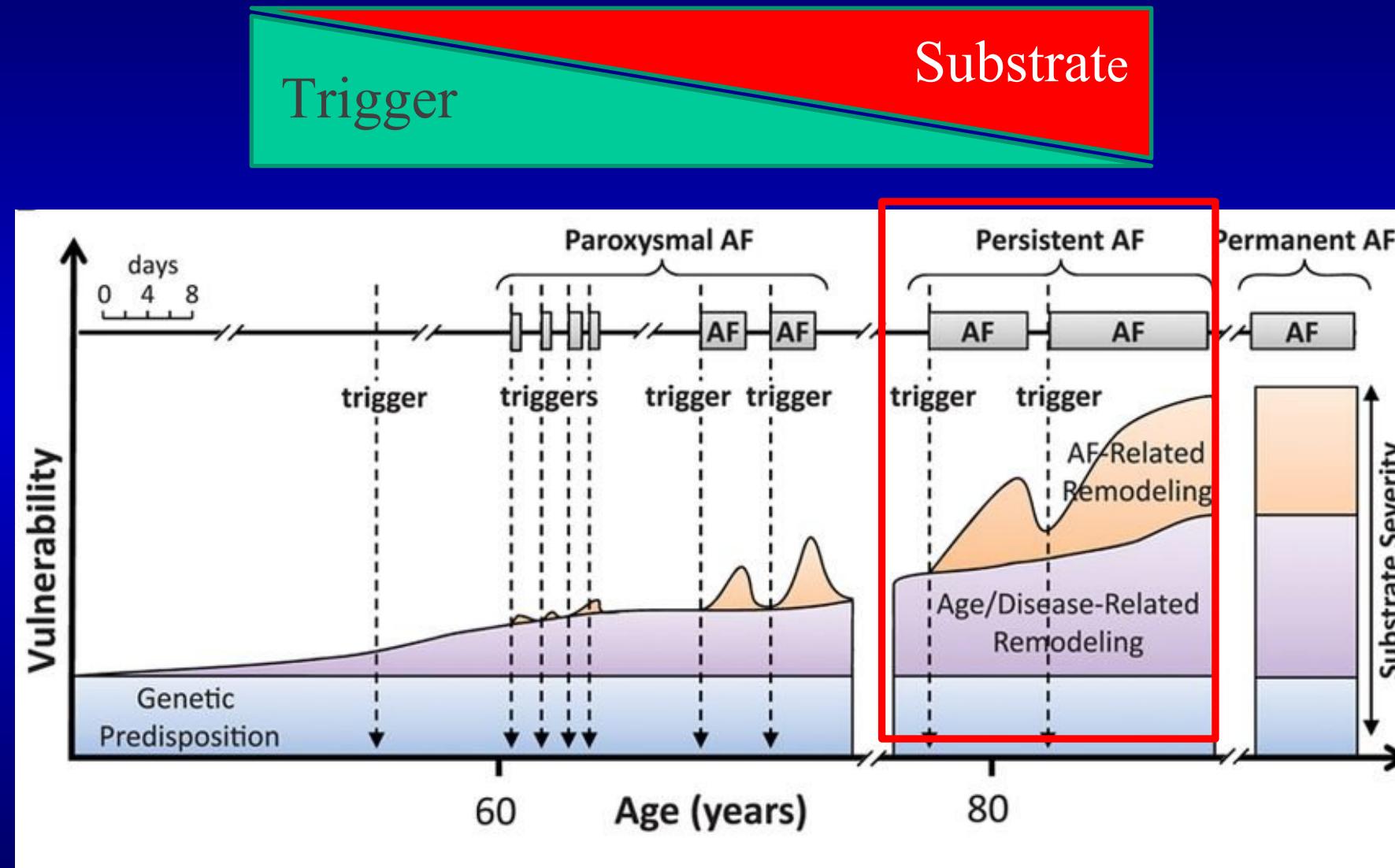
Not associated to structural heart disease:

- Sinus node dysfunction * *
- WPW syndrome
- Brugada syndrome
- Short QT syndrome

Associated to other conditions:

- Hyperthyroidism *
- Sleep apnoea syndrome
- Emery-Dreyfus dystrophy
- Athletes

AF Trigger & substrate



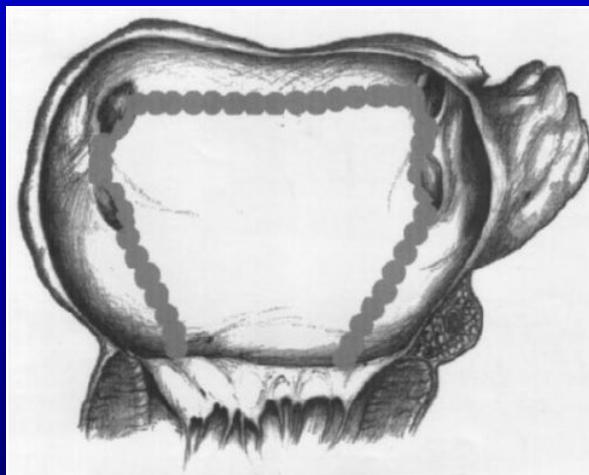
Surgical procedures: modification of substrate

Trigger



Substrate
atrium

Autonomic
Nervous
System



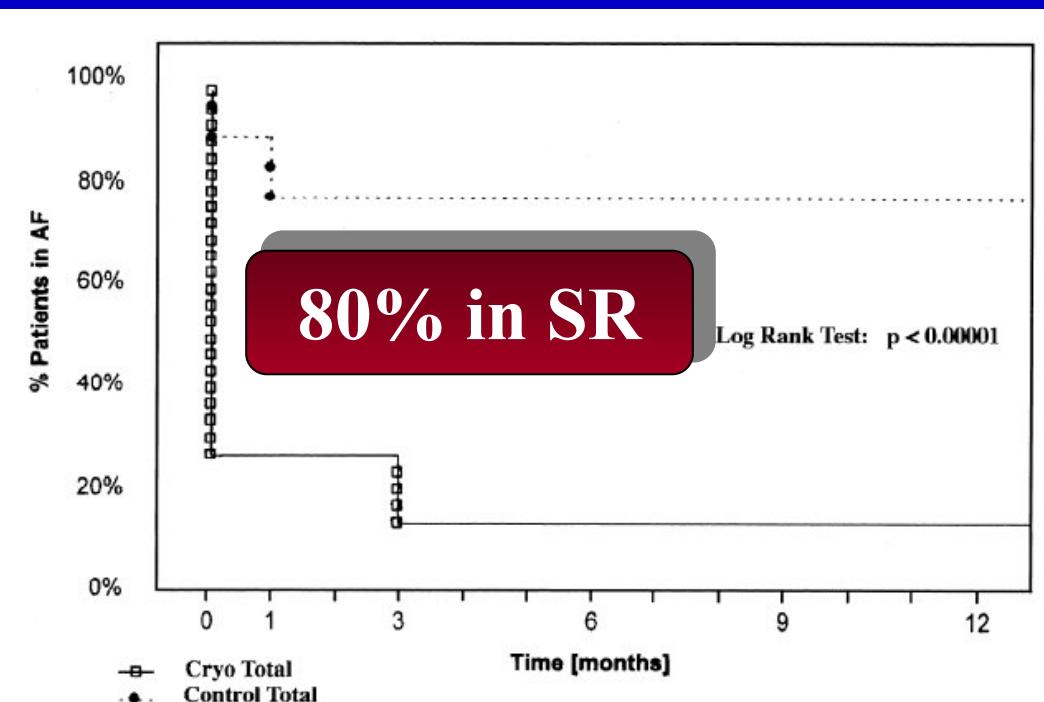
Journal of the American College of Cardiology
© 2000 by the American College of Cardiology
Published by Elsevier Science Inc.

Vol. 36, No. 1, 2000
ISSN 0735-1097/00/\$20.00
PII S0735-1097(00)00657-4

Limited Posterior Left Atrial Cryoablation in Patients With Chronic Atrial Fibrillation Undergoing Valvular Heart Surgery

Fiorenzo Gaita, MD,* Roberto Gallotti, MD,* Leonardo Calò, MD, Eric Manasse, MD,* Riccardo Riccardi, MD, Lucia Garberoglio, MD, Francesco Nicolini, MD,* Marco Scaglione, MD, Paolo Di Donna, MD, Domenico Caponi, MD, Giorgio Franciosi, MD*

Asti and Rozzano, Italy



Surgical ablation is effective
with high percentage of
success, but extremely

invasive



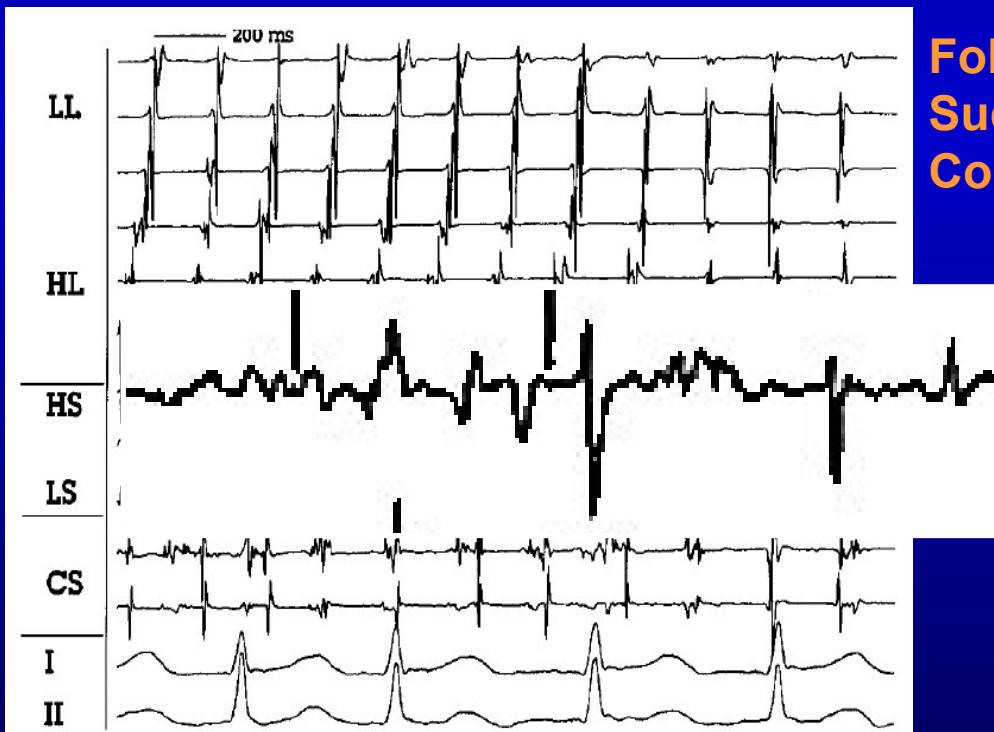
1998 started TC Ablation

Atrial Mapping and Radiofrequency Catheter Ablation in Patients With Idiopathic Atrial Fibrillation

Electrophysiological Findings and Ablation Results

Fiorenzo Gaita, MD; Riccardo Riccardi, MD; Leonardo Calò, MD; Marco Scaglione, MD;
Lucia Garberoglio, MD; Renzo Antolini, PhD; Michele Kirchner, PhD;
Filippo Lamberti, MD; Elena Richiardi, MD

(*Circulation*. 1998;97:2136-2145.)



Follow-up (months)	11 ± 4	36 ± 6
Success	56%	39%
Complications	none	none

Predictors of success:
ablation in areas with
fractionated shortest
FF interval,
low vagal tone
demonstrated by heart rate variability

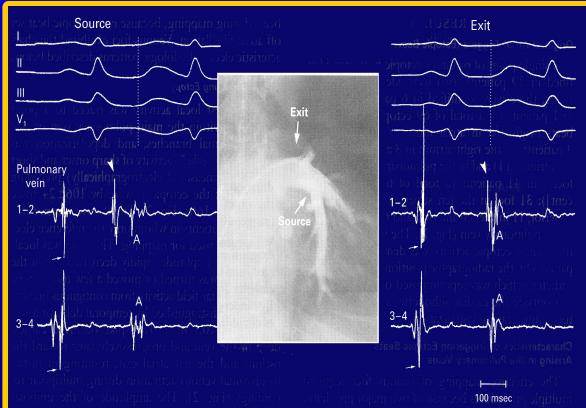
The new idea: PV ablation as anatomical target

Interest moves from *substrate* to *triggers*

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

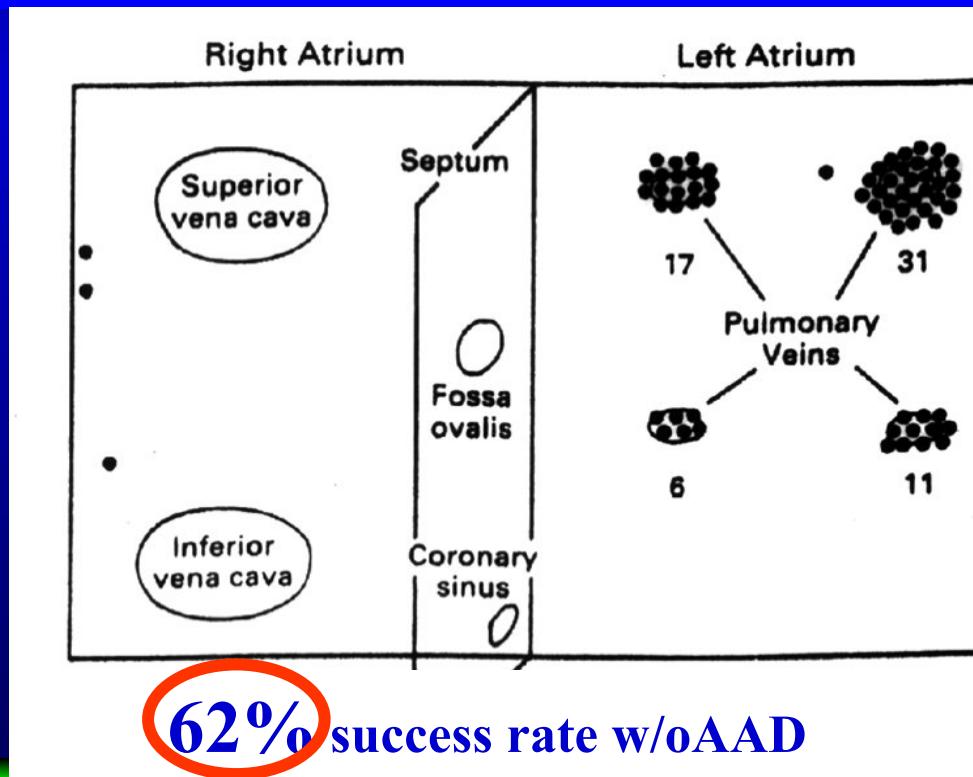
MICHEL HAÏSSAGUERRE, M.D., PIERRE JAÏS, M.D., DIPEN C. SHAH, M.D., ATSUSHI TAKAHASHI, M.D., MÉLÈZE HOCINI, M.D., GILLES QUINIOU, M.D., STÉPHANE GARRIGUE, M.D., ALAIN LE MOUROUX, M.D., PHILIPPE LE MÉTAYER, M.D., AND JACQUES CLÉMENTY, M.D.

NEJM 1998;339:659-666

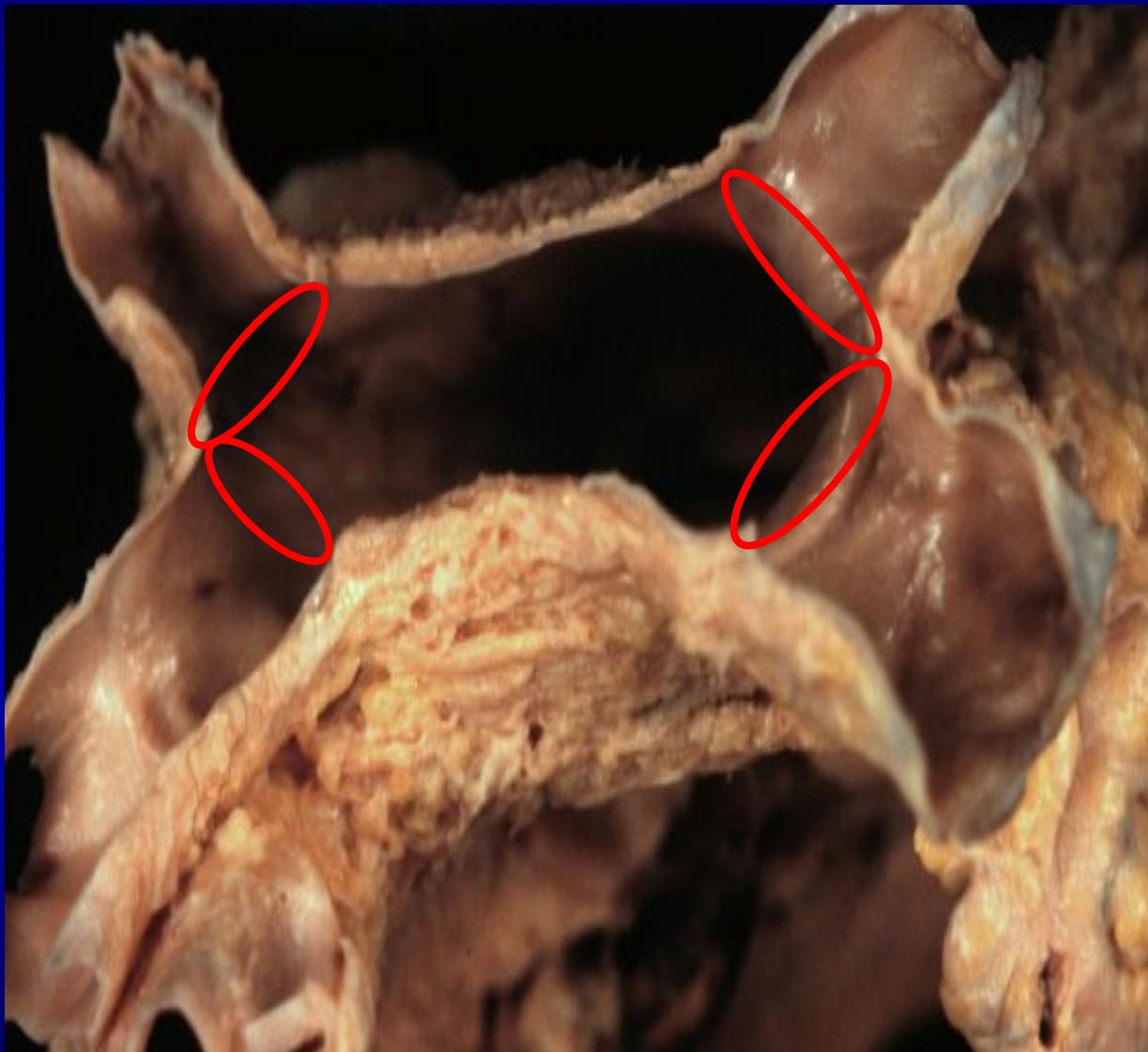


45 pts with
idiopathic PAF

Follow-up:
8 ± 6 months

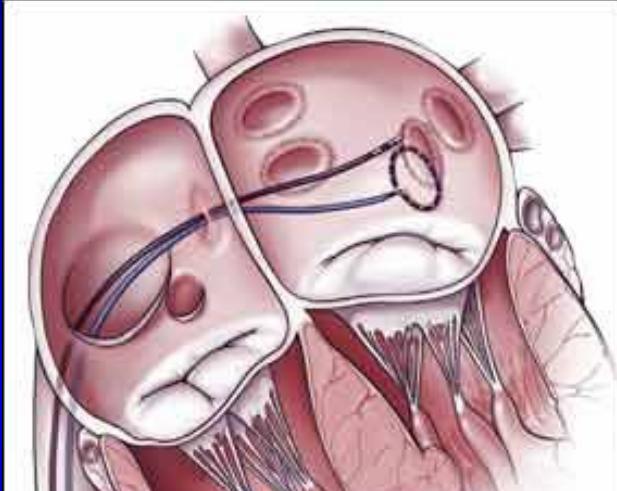


AF ablation not only PVI



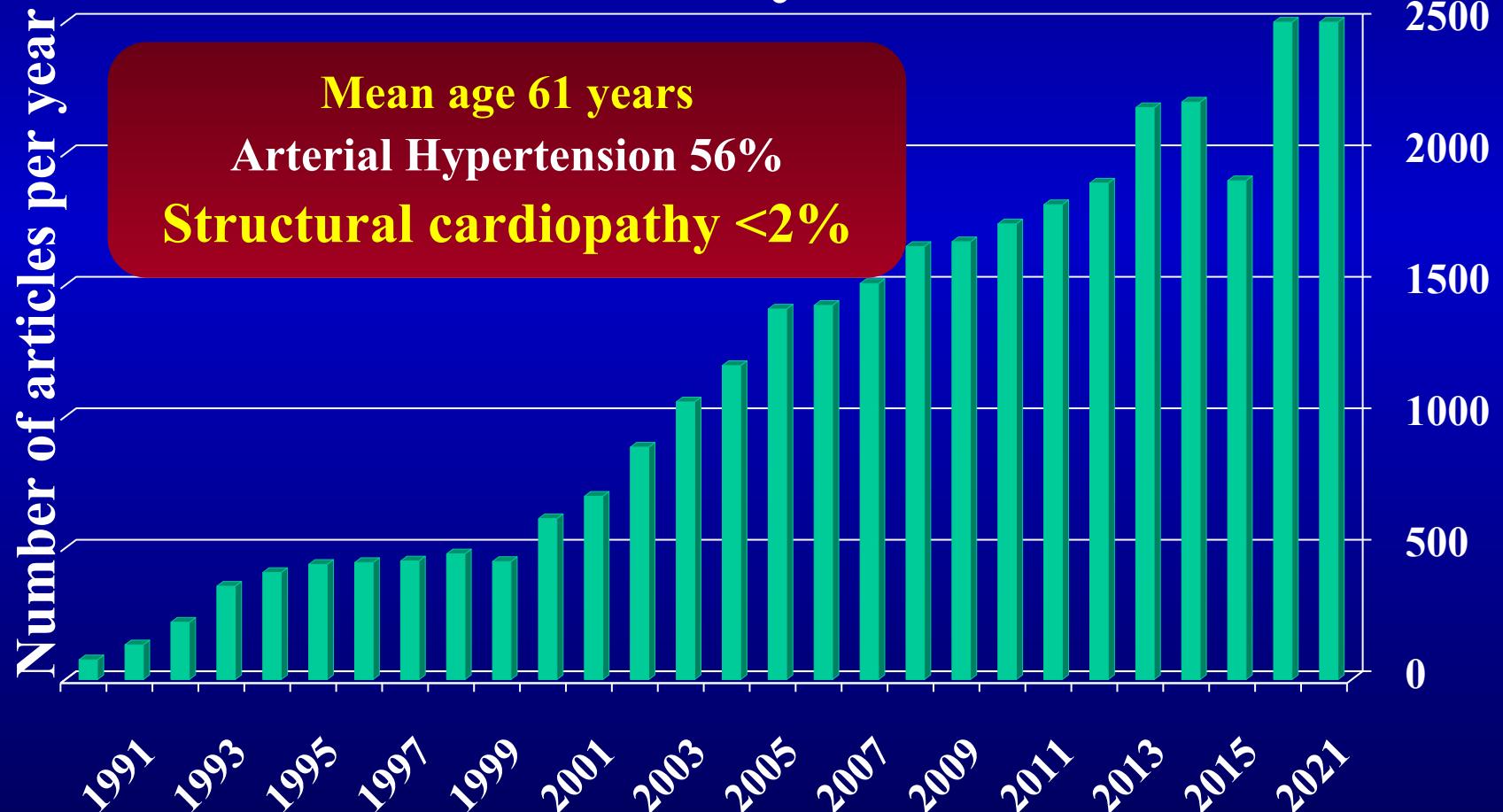
Courtesy of Dr. Damian Sanchez-Quintana

Ablation of paroxysmal AF: PVI...but which tool?



In medicine when something works it spreads worldwide

Publications over the years on AF ablation



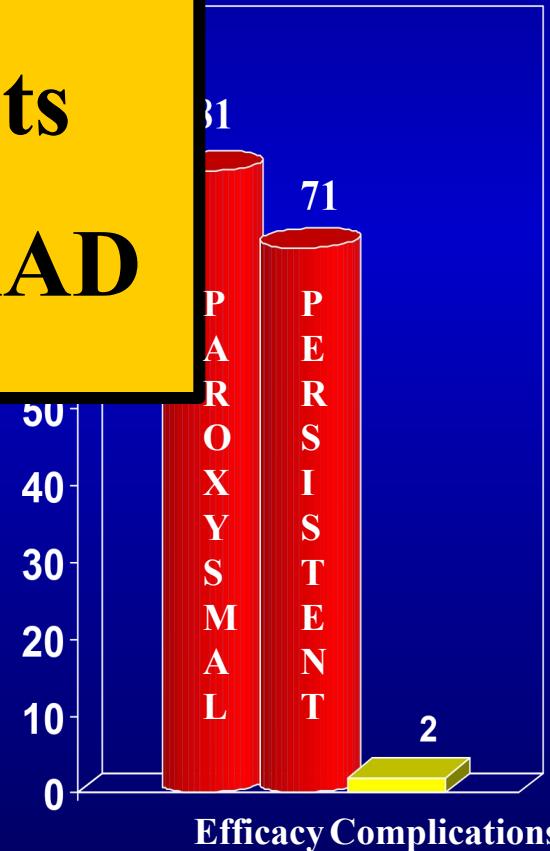
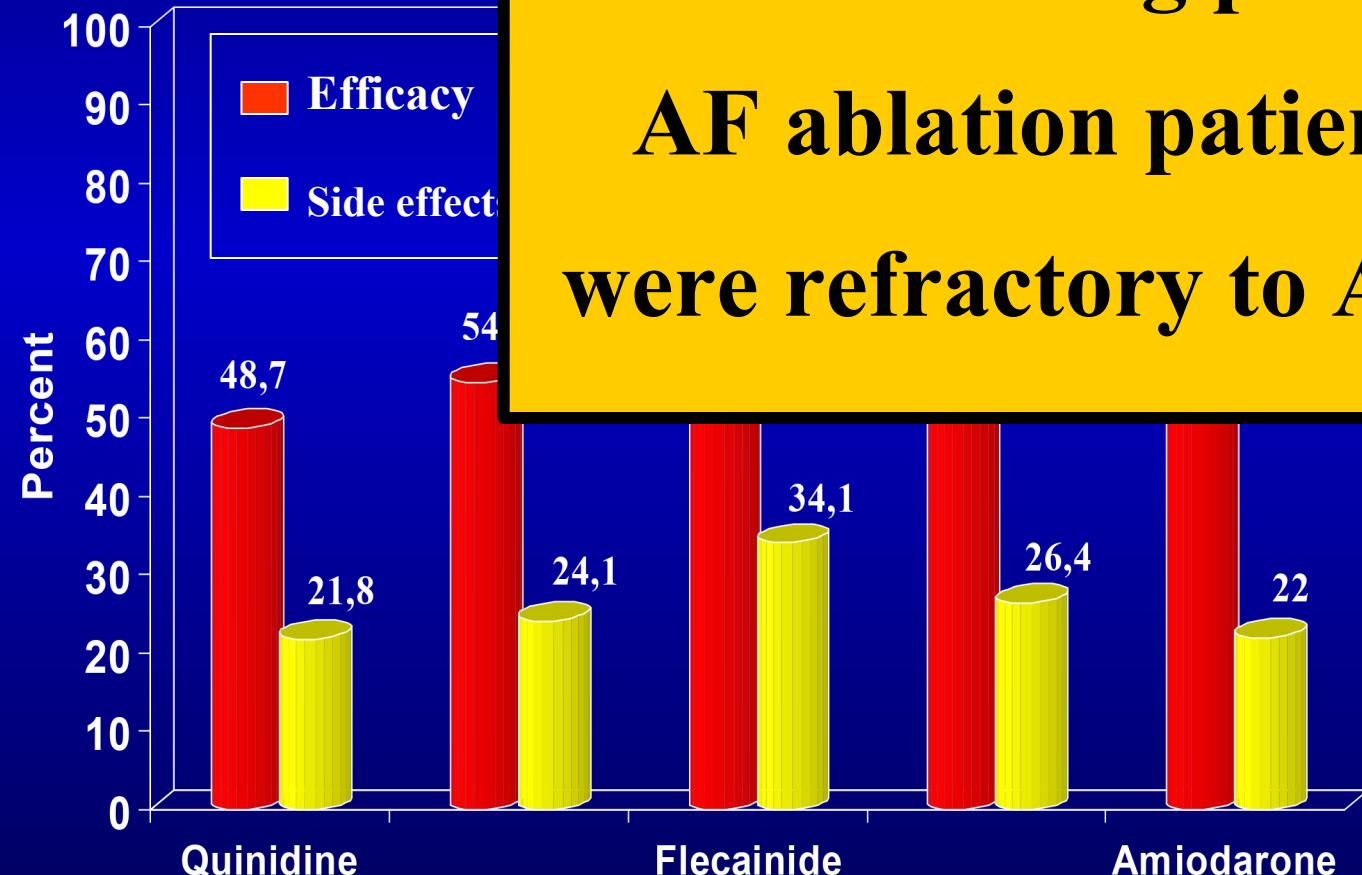
AF ablation in the last 3 years (~1 year F-up)

AADs for AF (~1 year F-up)

Bias in selecting patients:

AF ablation patients

were refractory to AAD



**PVI is the easiest way to perform
AF ablation,**

it is the Target for Paroxysmal AF

When substrate is “the boss”
 (“persistent” AF/long-standing
 AF/structural heart disease)

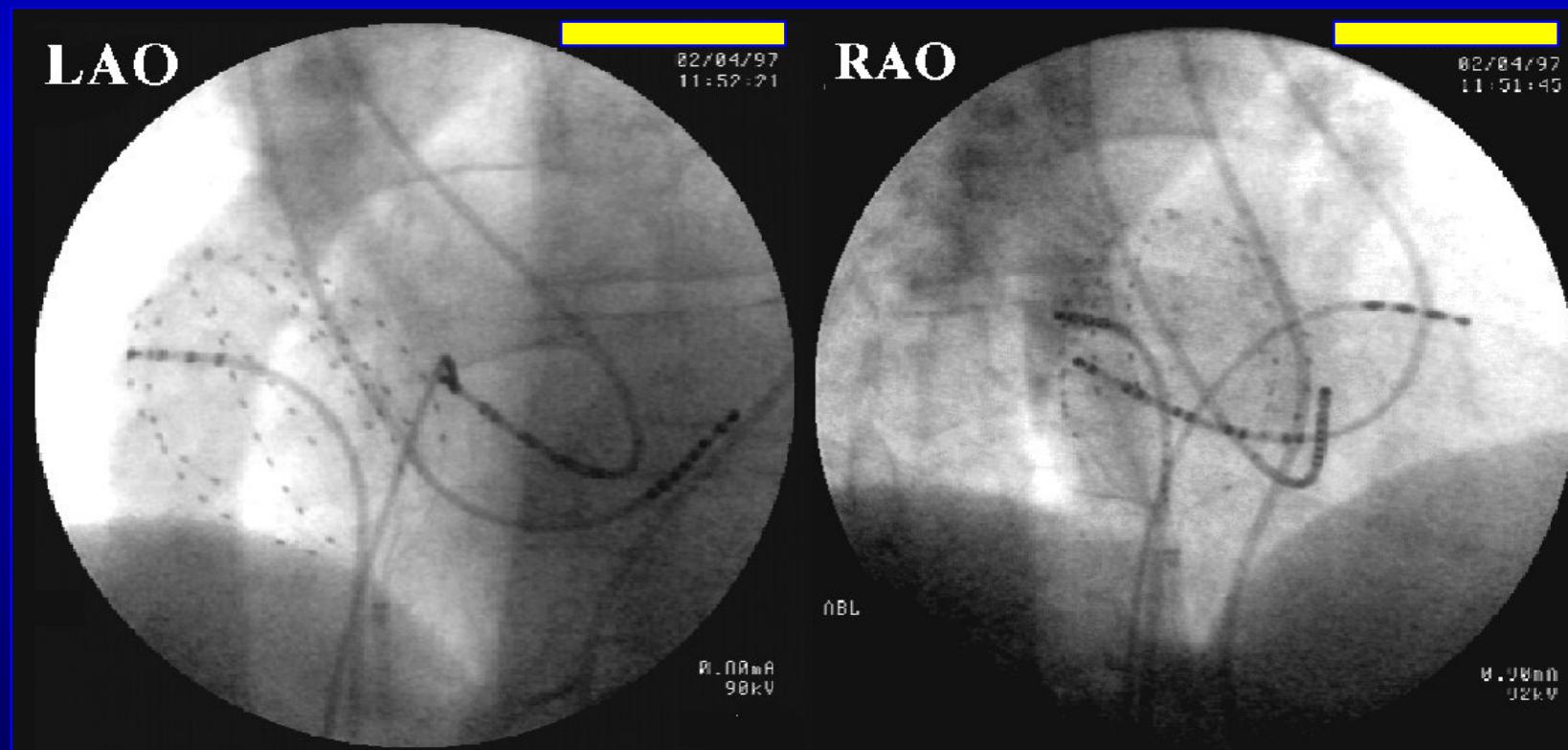
PVI alone is not enough

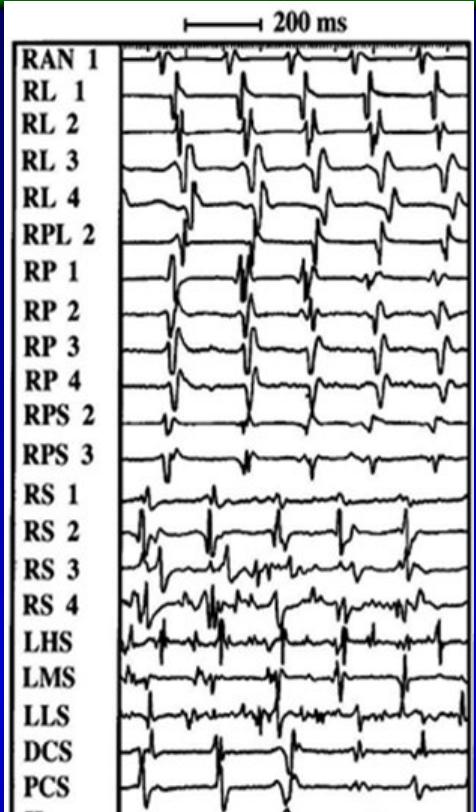
Different Patterns of Atrial Activation in Idiopathic Atrial Fibrillation: Simultaneous Multisite Atrial Mapping in Patients With Paroxysmal and Chronic Atrial Fibrillation

Fiorenzo Gaita, MD*, Leonardo Calò, MD,* Riccardo Riccardi, MD,* Lucia Garberoglio, MD,*
Marco Scaglione, MD,* Giovanni Licciardello, MD,* Luisella Coda, MD,* Paolo Di Donna, MD,*
Mario Bocchiardo, MD,* Domenico Caponi, MD,* Renzo Antolini, PhD,† Fulvio Orzan, MD,‡
GianPaolo Trevi, MD‡

Asti, Trento and Torino, Italy

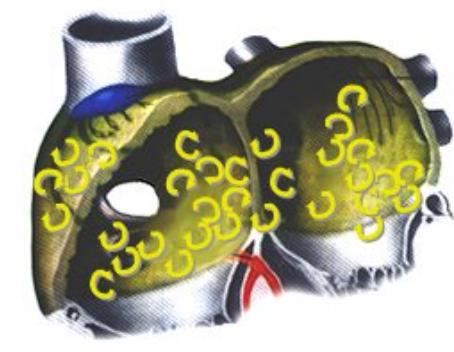
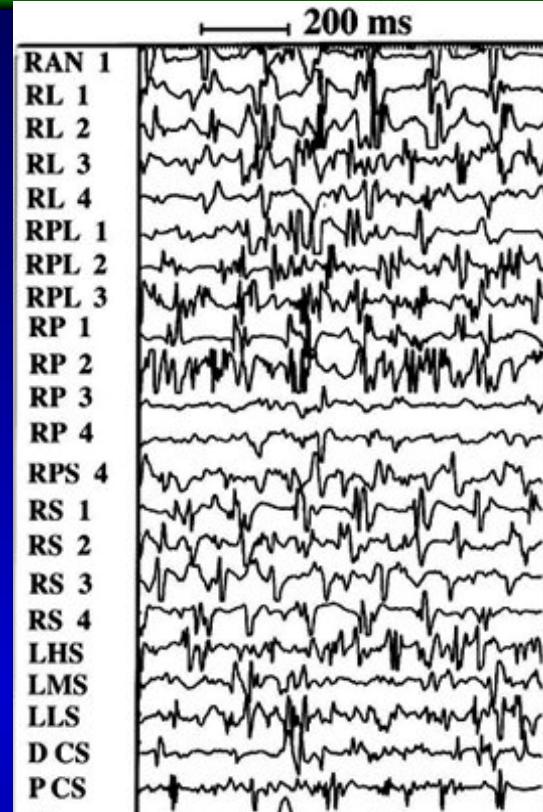
JACC 2001;37:534





Paroxysmal AF (type
A)

Areas with complex
fractionated electrograms are
smaller in paroxysmal AF,
larger in persistent AF



Persistent AF (type
D)

What about AF and
structural heart disease?
(HF, HCM, VHD....)

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

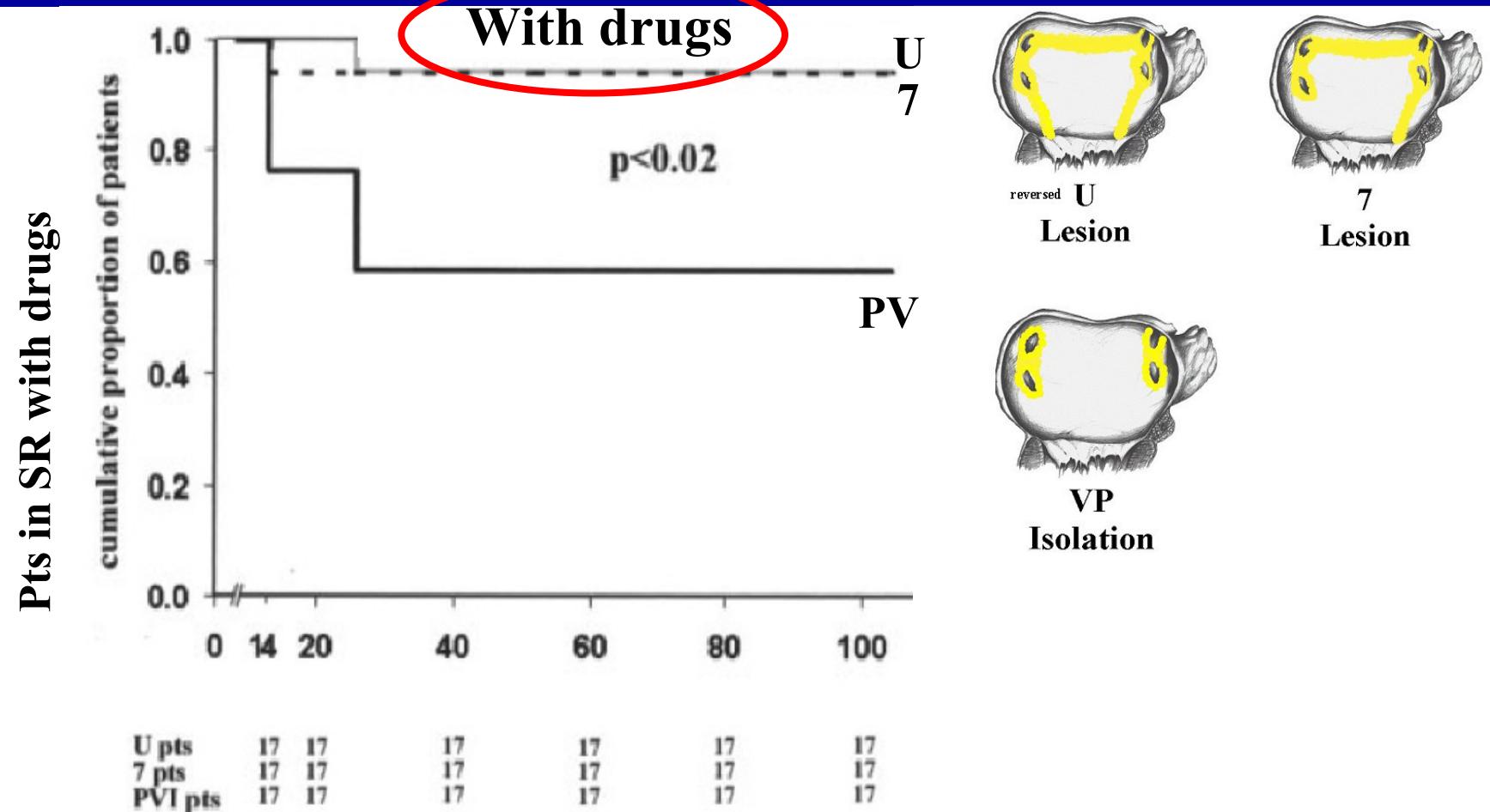
Circulation

2005;111:136-42

Correlation of Electroanatomic Mapping and Long-Term Clinical Results

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

Permanent AF
and Valvular
Heart Disease



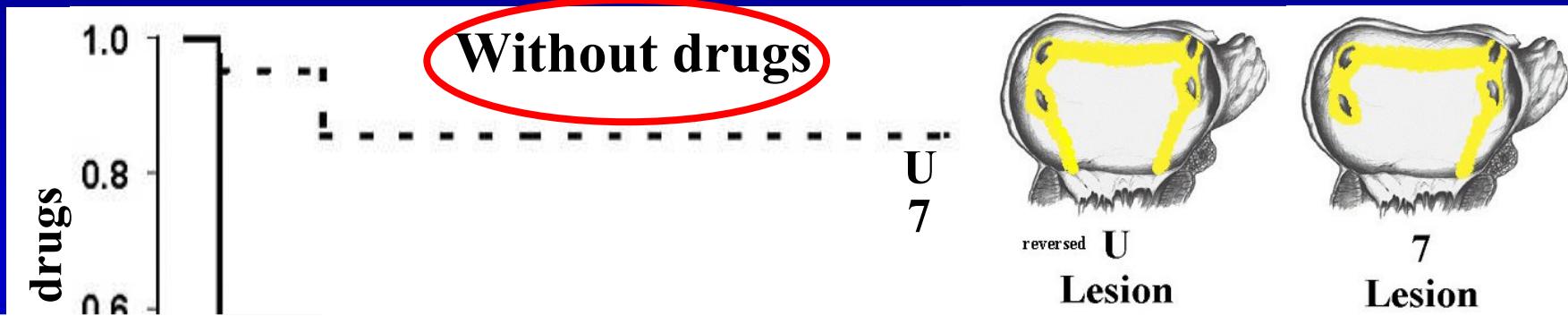
Linear Cryoablation of the Left Atrium Versus Pulmonary Vein Cryoisolation in Patients With Permanent Atrial Fibrillation and Valvular Heart Disease

2005;111:136-42

Correlation of Electroanatomic Mapping and Long-Term Clinical Results

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

**Permanent AF
and Valvular
Heart Disease**

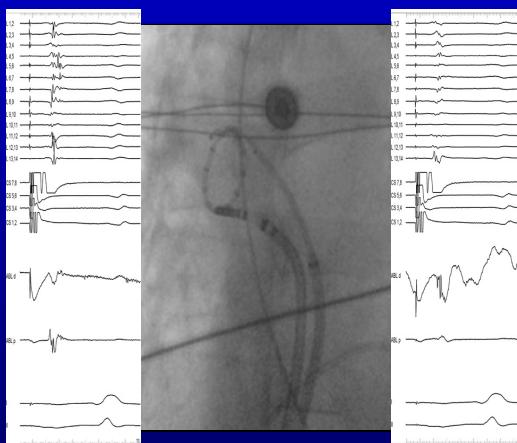
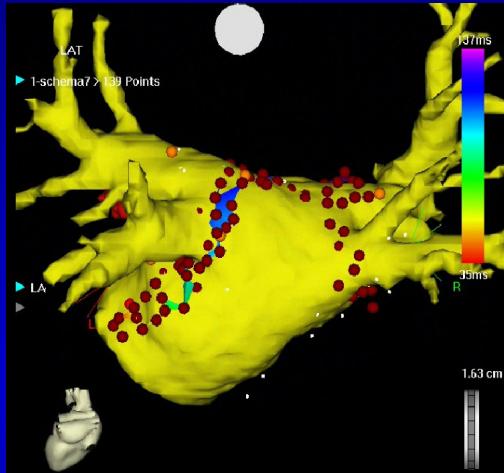


**For Long Standing AF and/or if present Structural HD
(remodelled atrium)**

**PV isolation alone is not sufficient:
we have to add substrate ablation
(linear and/or CFAE)**

AF ablation in structural heart disease

HCM vs. other CMP vs. lone AF



Total population : 78 pts F-up: 19±10 months

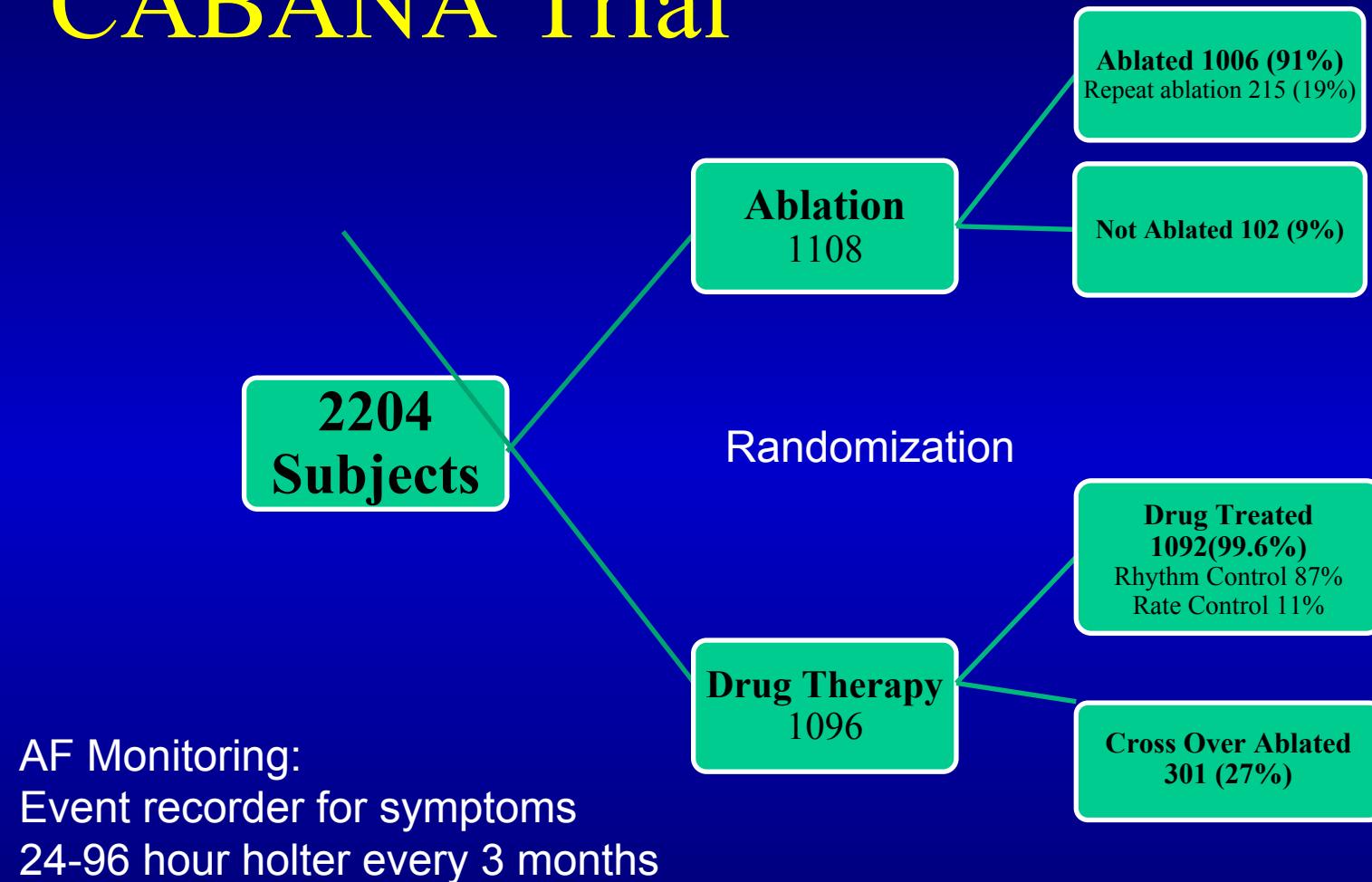
Success	% of success	HCM (n = 26)	Other cardiopathies (n = 26)	idiopathic AF (n = 26)
Total	64%	64%	65%	77%
PAF				
AF Pers/Perm				

Gaita F et al, Am J Cardiol 2007;99:1575–1581

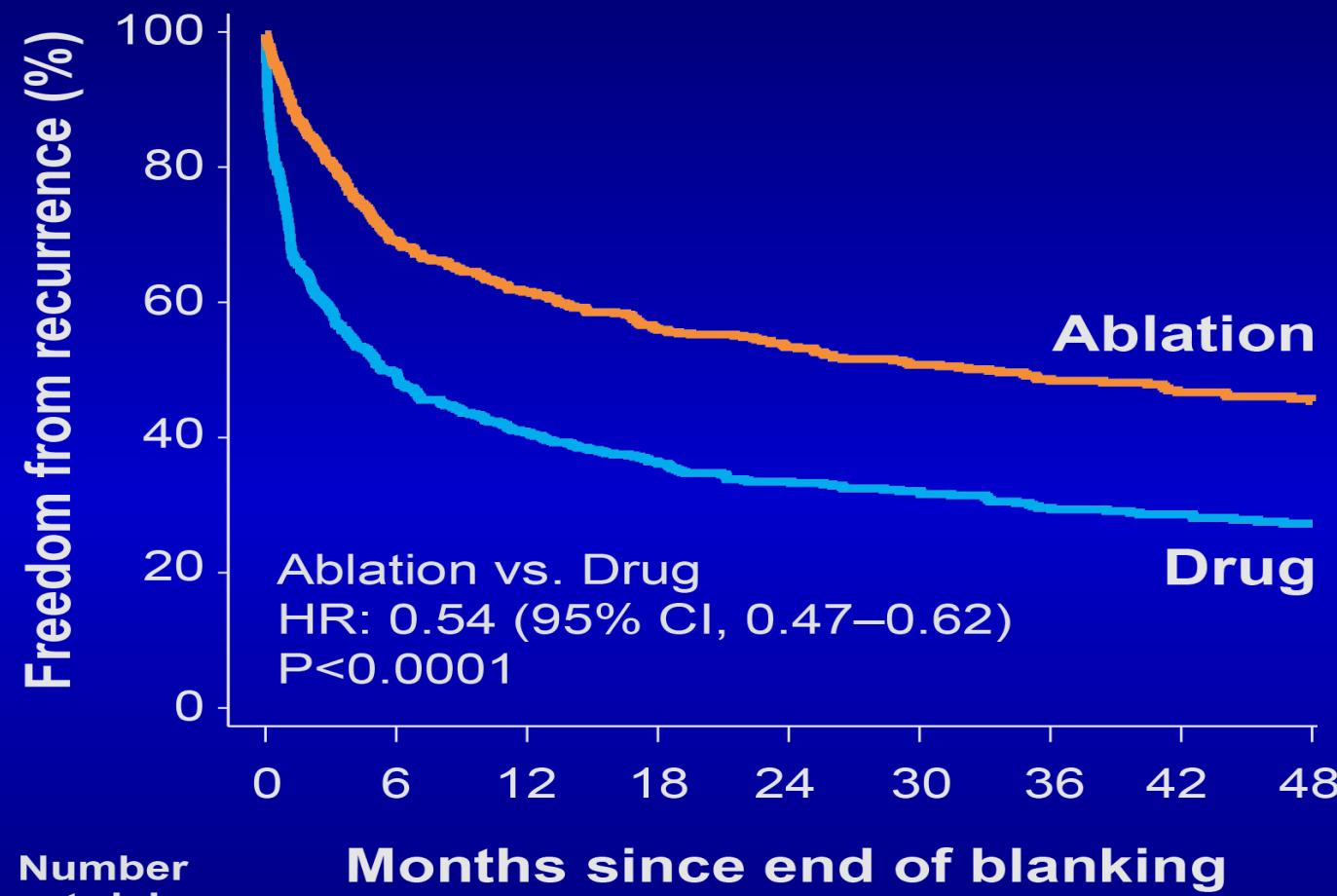
Major complications: none

**AF ablation is proved to be
more effective than AAD in
term of recurrences,
symptoms and QoL**

CABANA Trial



Atrial Fibrillation/Flutter



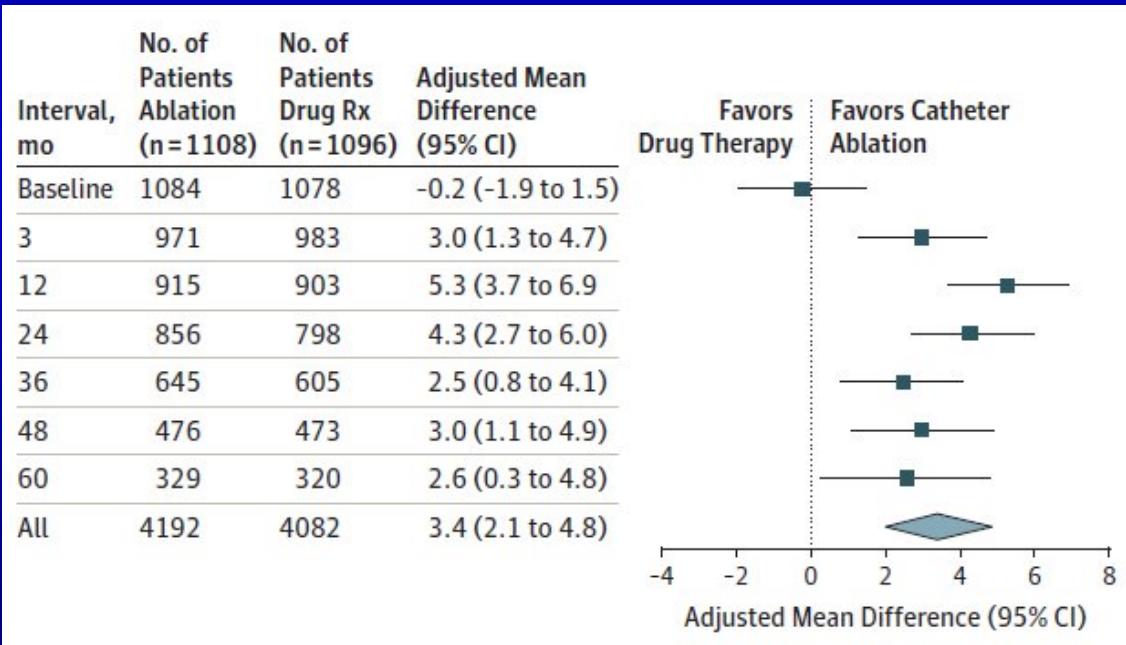
Number at risk:

Drug	629	311	255	210	178	155	127	112	92
Ablation	611	422	373	322	287	239	198	161	132

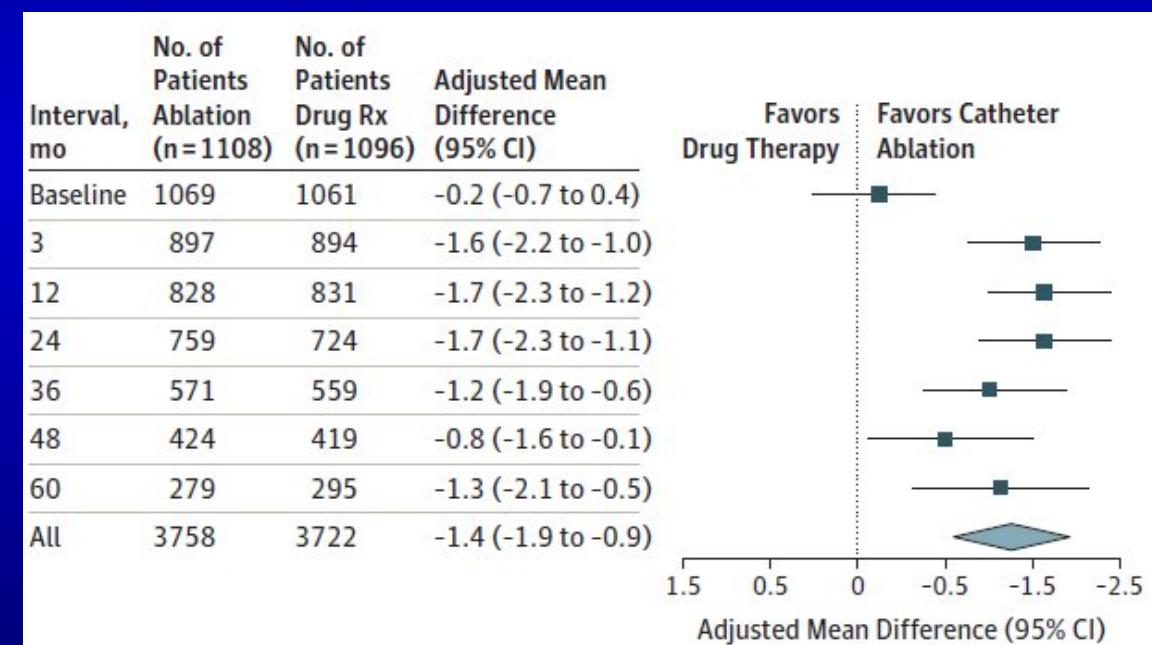
Effect of Catheter Ablation vs Medical Therapy on Quality of Life Among Patients With Atrial Fibrillation

The CABANA Randomized Clinical Trial

QoL



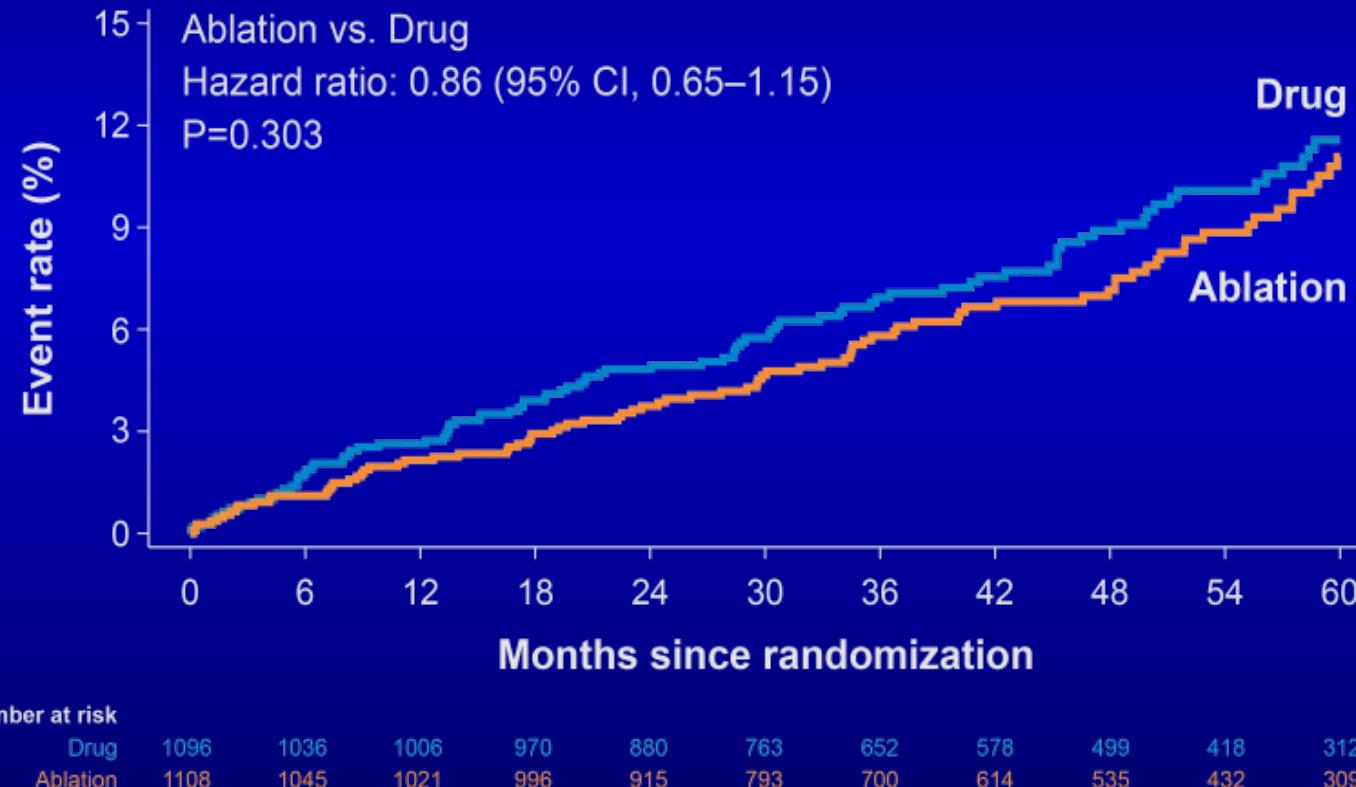
Symptoms



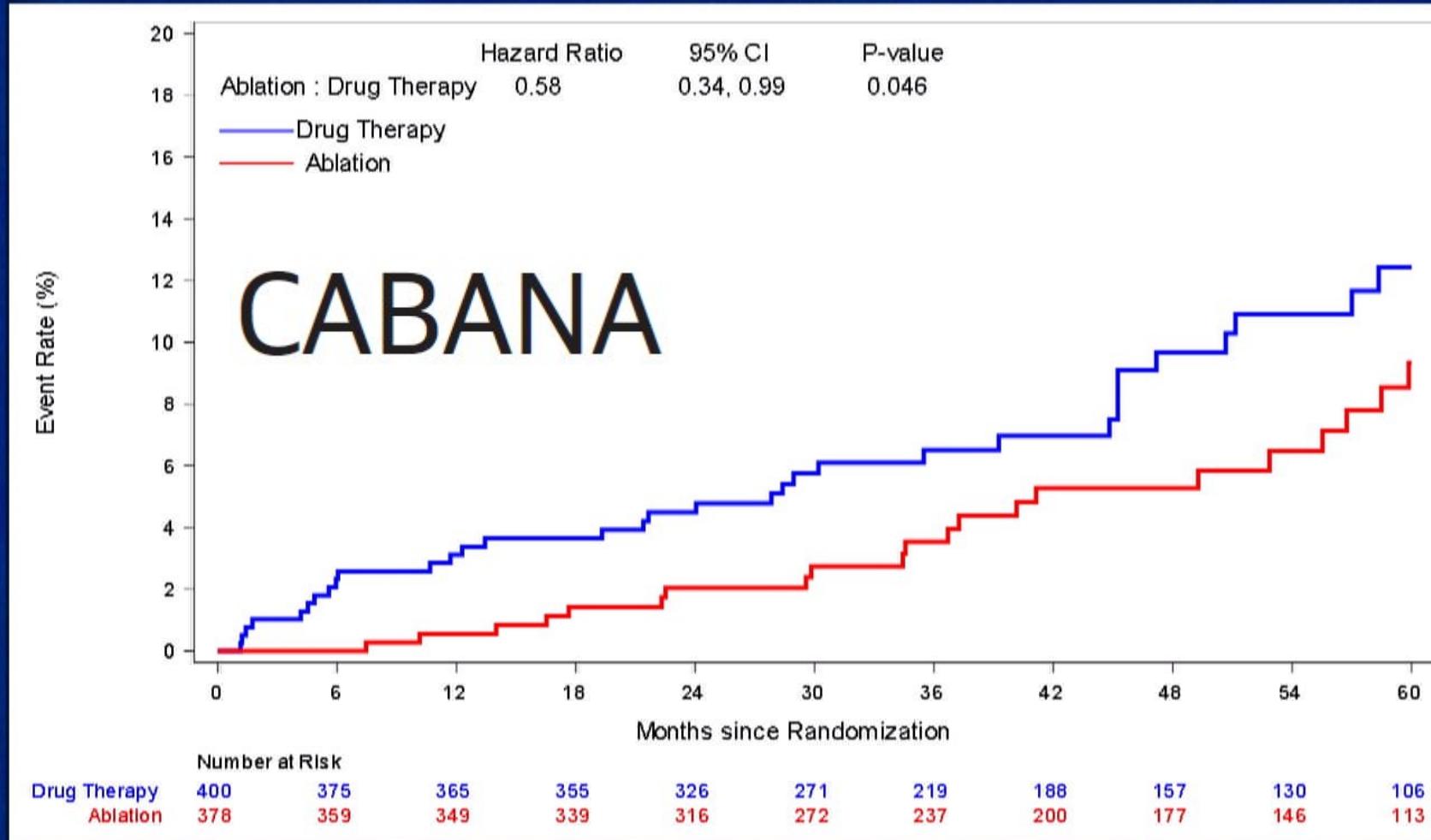
CONCLUSION This randomized trial of patients with symptomatic AF found that catheter ablation led to clinically important and significant improvements in quality of life at 12 months.

CABANA Primary Composite Endpoint

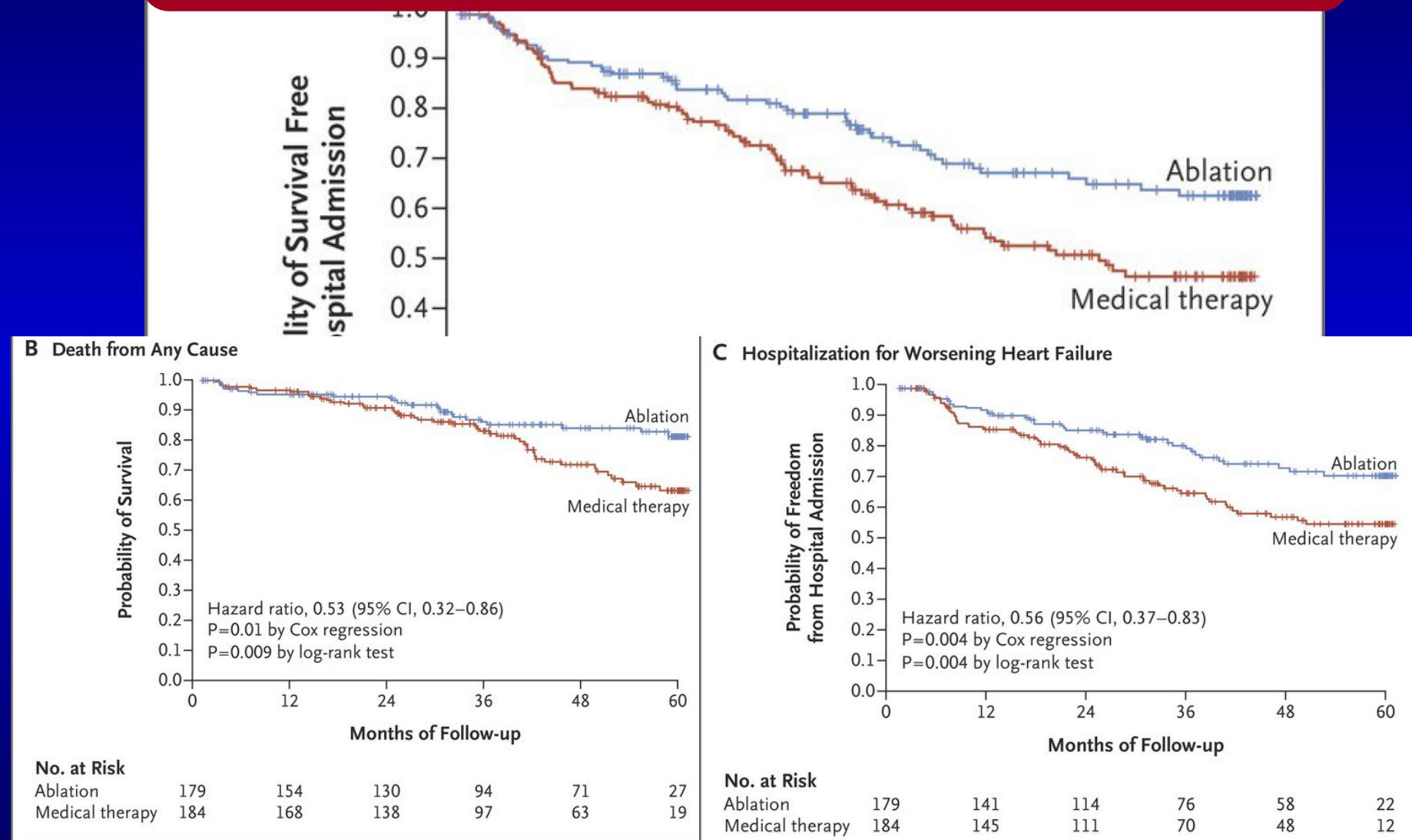
Death, Disabling Stroke, Serious Bleeding, or Cardiac Arrest



Risk of All-Cause Mortality (ITT): In HF Patients



Catheter Ablation for Atrial Fibrillation with Heart Failure



#10

AF ablation not only improves
symptoms and QoL, but also
reduces hospitalizations and
mortality in HF pts

Conclusion

If the good Lord (or natural evolution)
gave us Sinus Rhythm and not Atrial
Fibrillation there must be a reason.

After questioned this rule for 30 years,
finally the studies have shown He was right.