



Advances in Cardiovascular Arrhythmias
Great Innovations in Cardiology

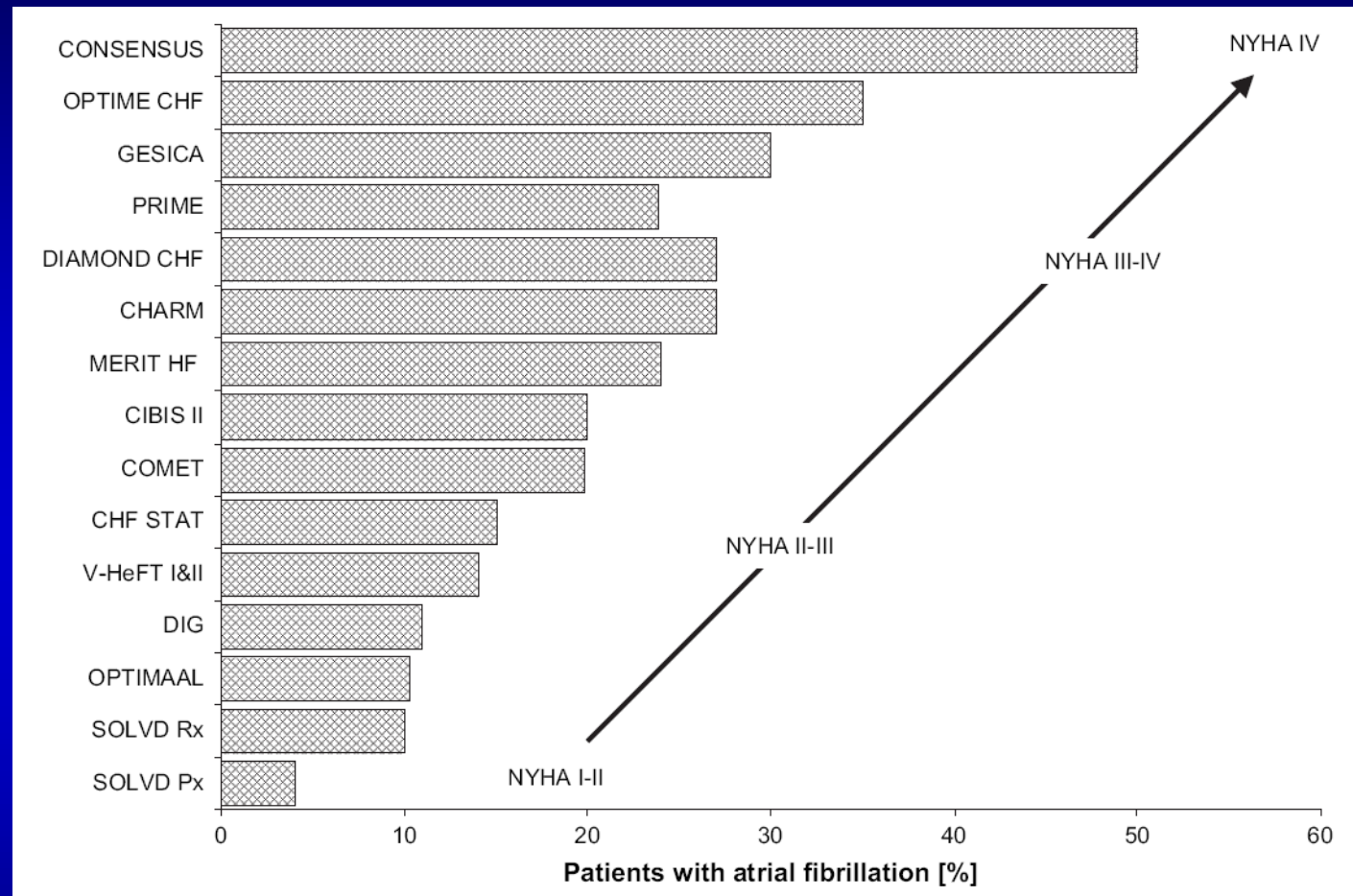
Interventional solutions for atrial fibrillation in patients with heart failure

Matteo Anselmino, MD PhD

**Division of Cardiology
Department of Medical Sciences**

**Città della Salute e della Scienza Hospital
University of Turin, Italy**

Prevalence of AF in clinical studies on CHF



CHF increases the risk of AF by a 4.5 factor in men and 5.9 in women

AF in pts with HF

increases the risk of death

- In the **VEST** study, **AF** caused an increase of 2.3 times the **risk of death** in patients with heart failure.

(Konety, AHA 1998)

- In the **AMIOVIRT** study, **AF** resulted an **independent risk factor** for mortality (RR 4) in pts with CHF.

(Strickberger, J Am Coll Cardiol 2004)

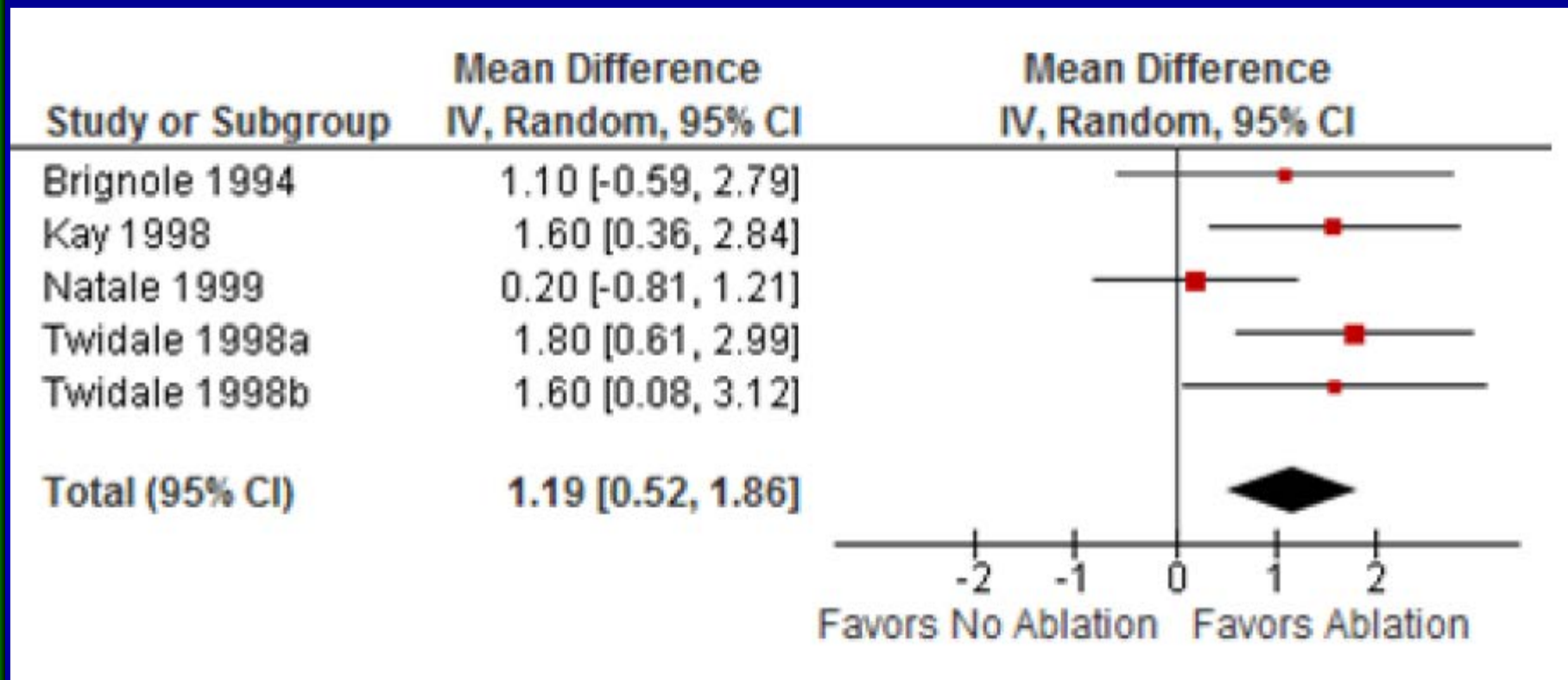
- In the **SOLVD** study, **AF** was an **independent risk factor** for mortality (RR 1.34) and progression of CHF (RR 1.42).

(Vermes, Circulation 2003)

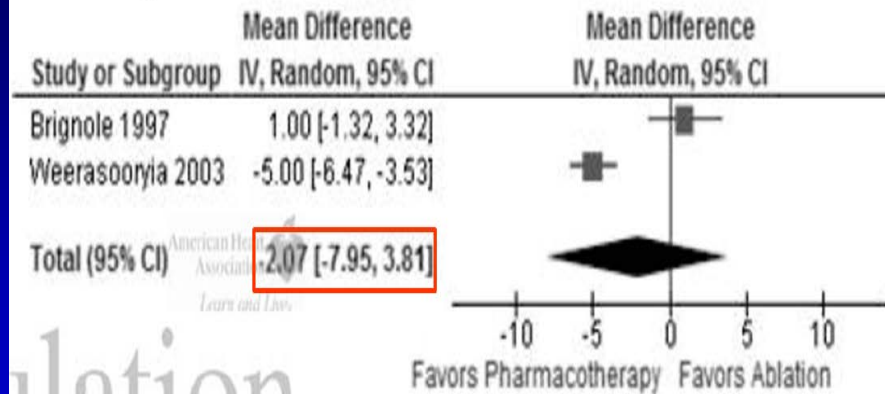
Interventional approaches to treat atrial fibrillation in patients with heart failure

- **AV node ablation + RV pacing (1990)**
- **AV node ablation + CRT (2000)**
- **Pulmonary vein isolation (2004)**

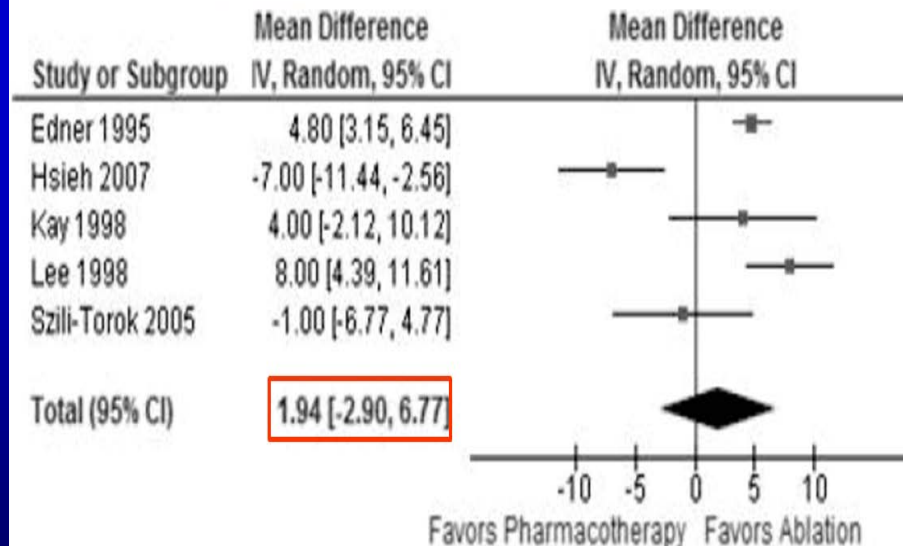
AV node ablation + RV pacing



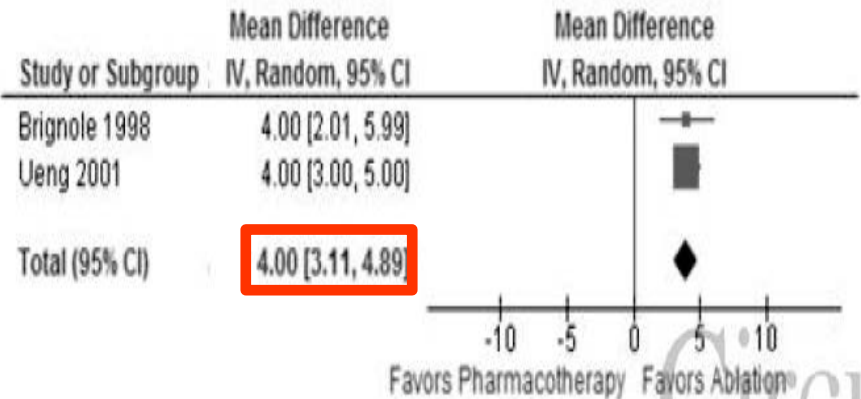
B Efficacy Studies (Normal EF)



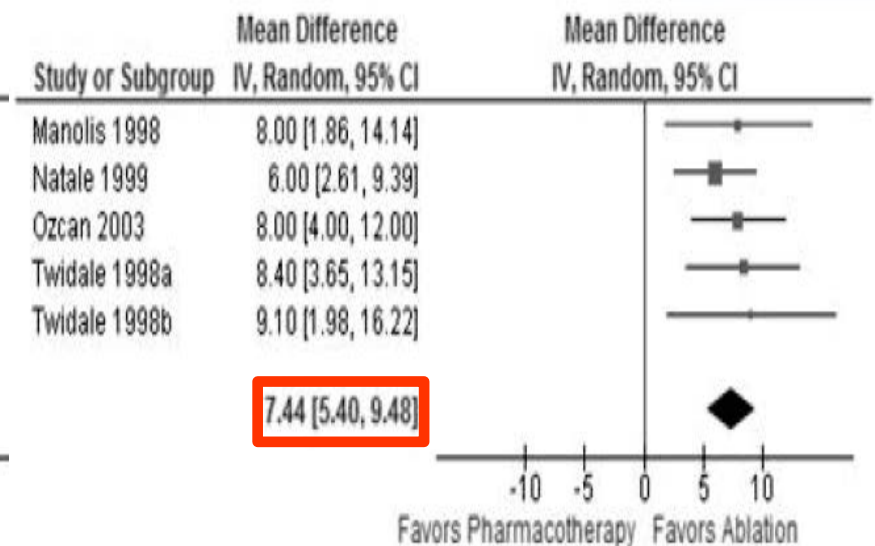
D Effectiveness Studies (Normal EF)



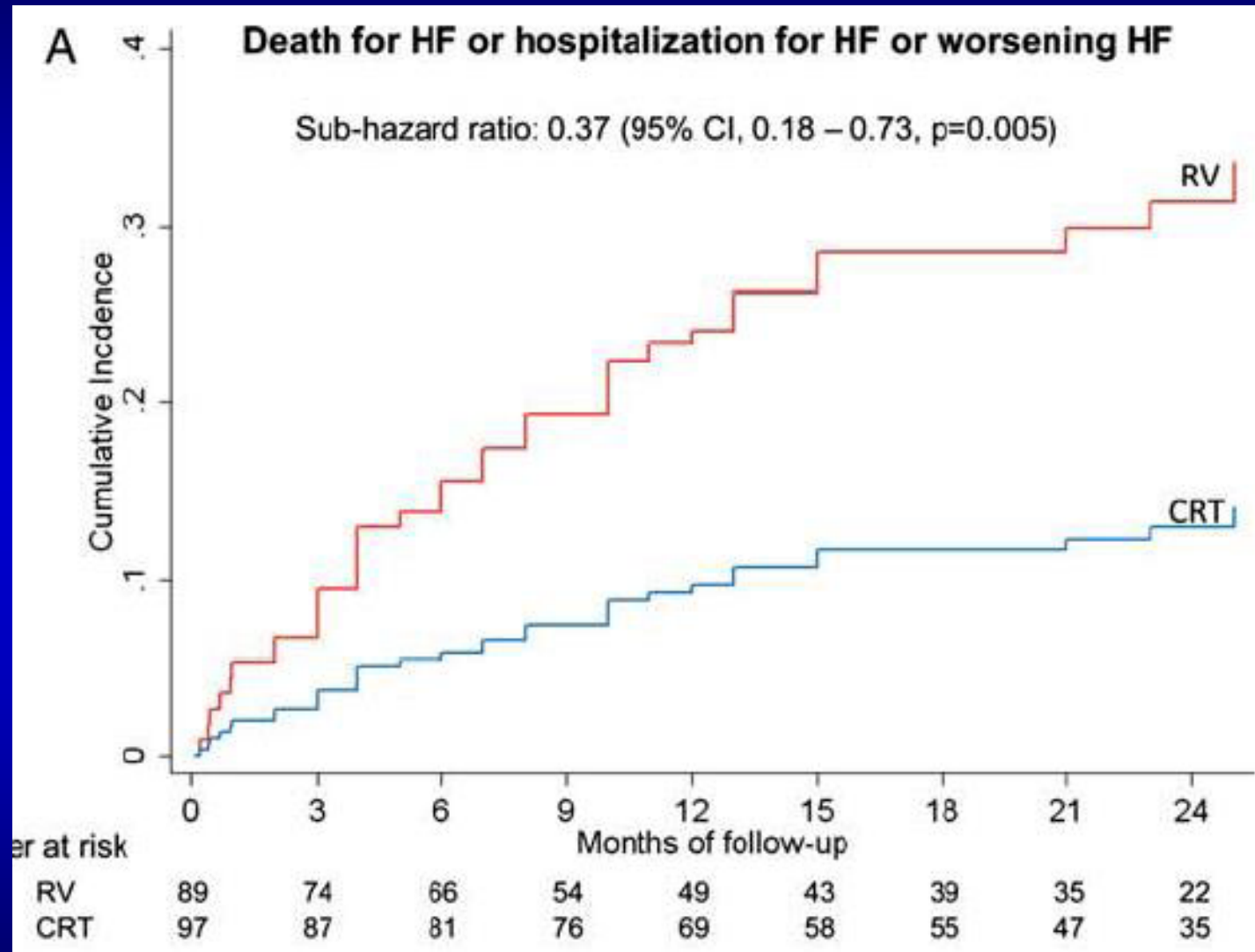
A Efficacy Studies (Reduced EF)

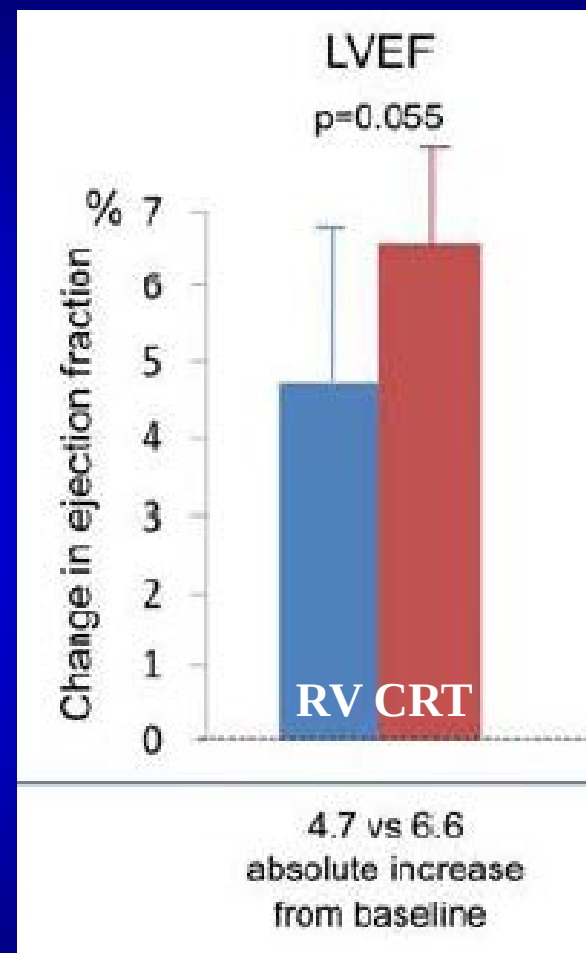
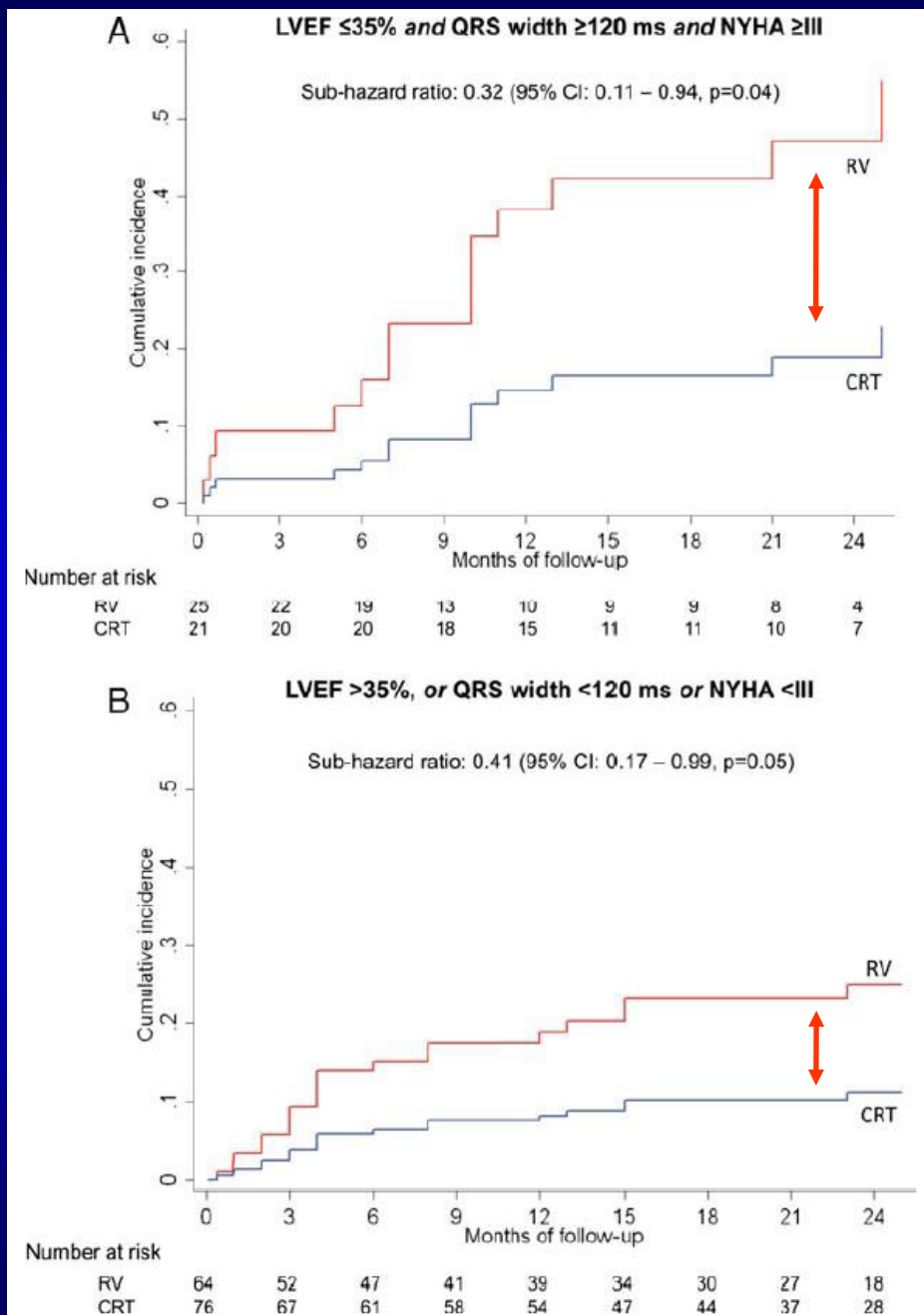


C Effectiveness Studies (Reduced EF)

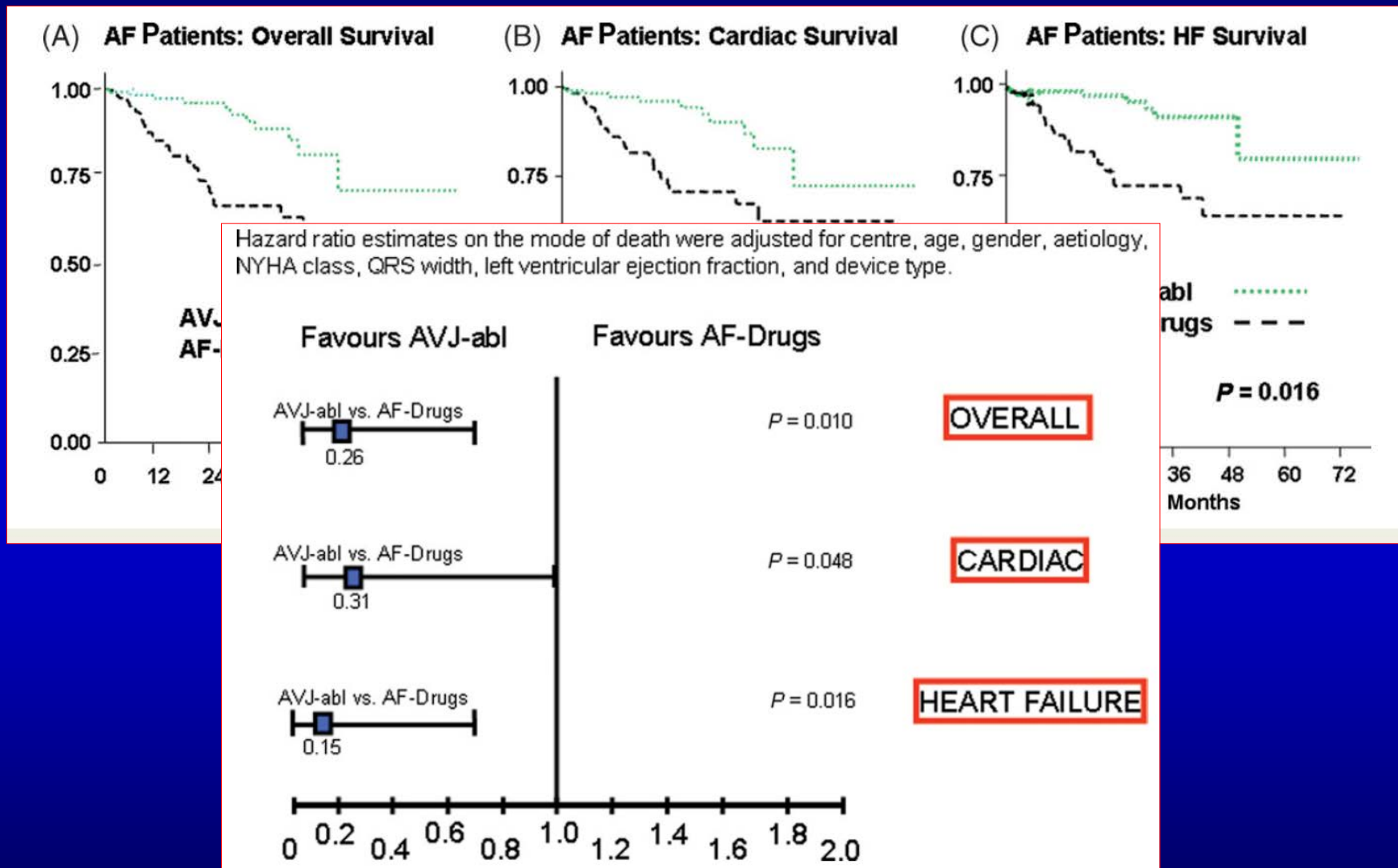


AV node ablation + RV vs CRT pacing

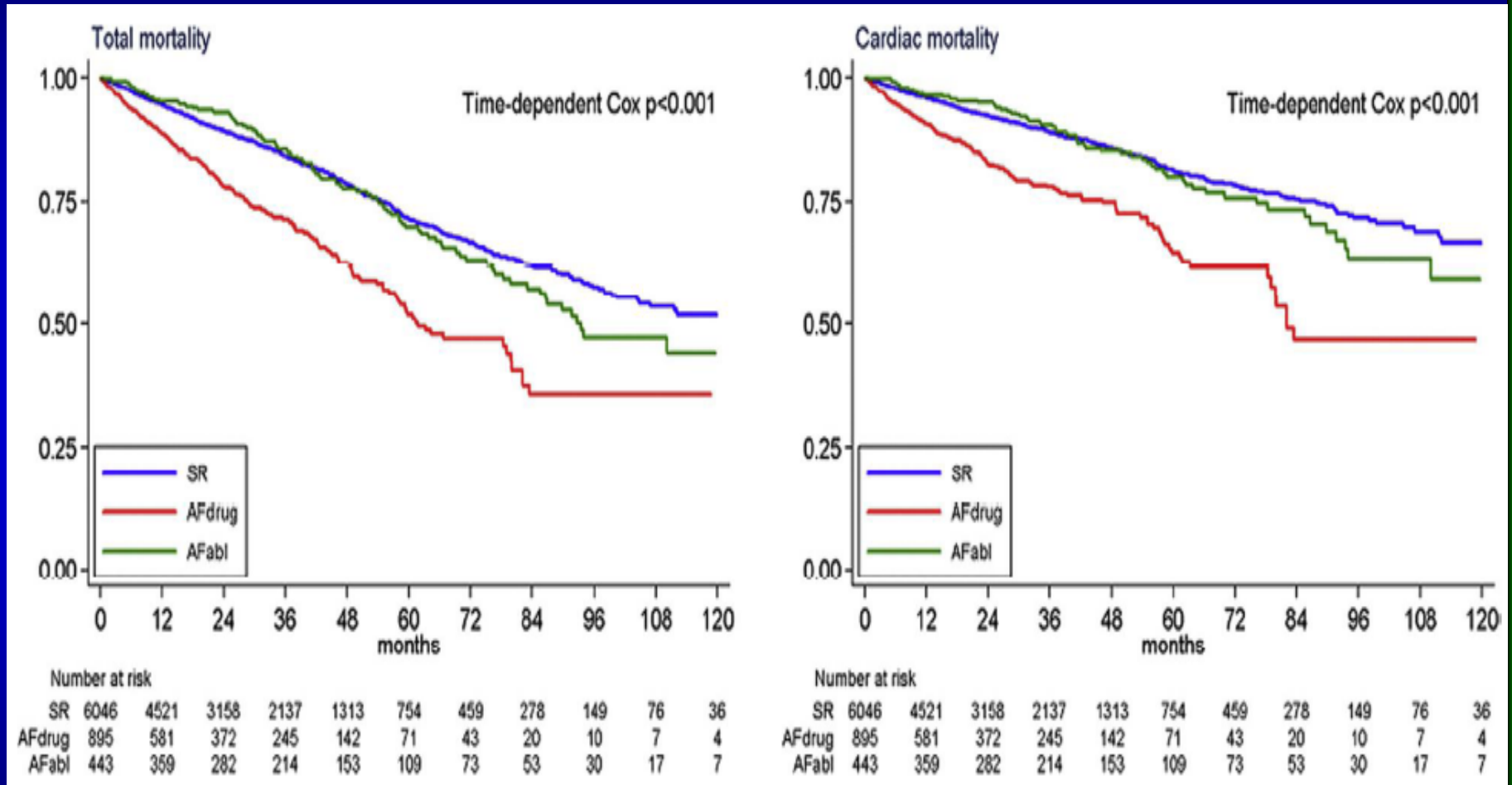




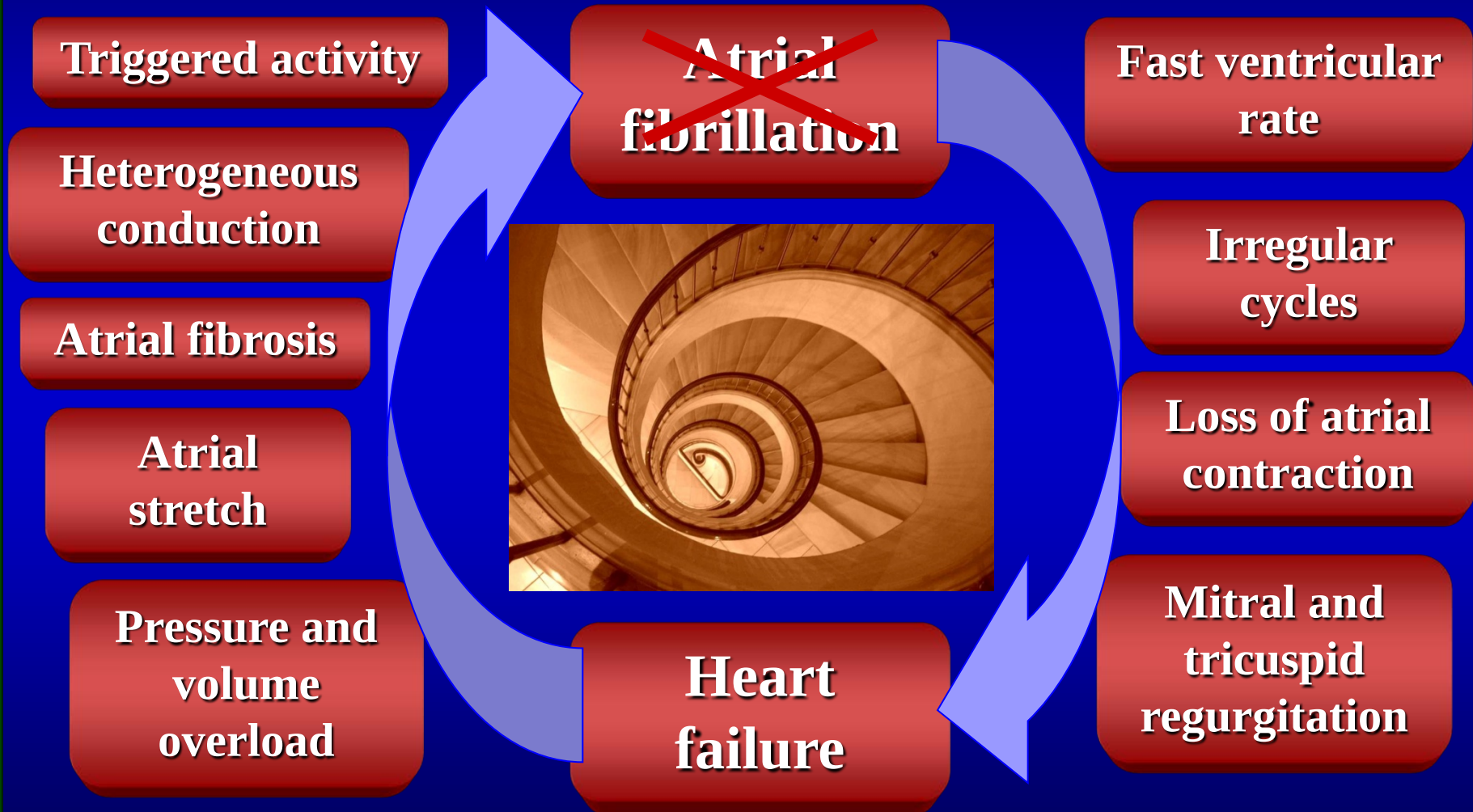
CRT + AV ablation vs. Drugs **MILOS** study



CRT + AV ablation vs Drugs **CERTIFY** study

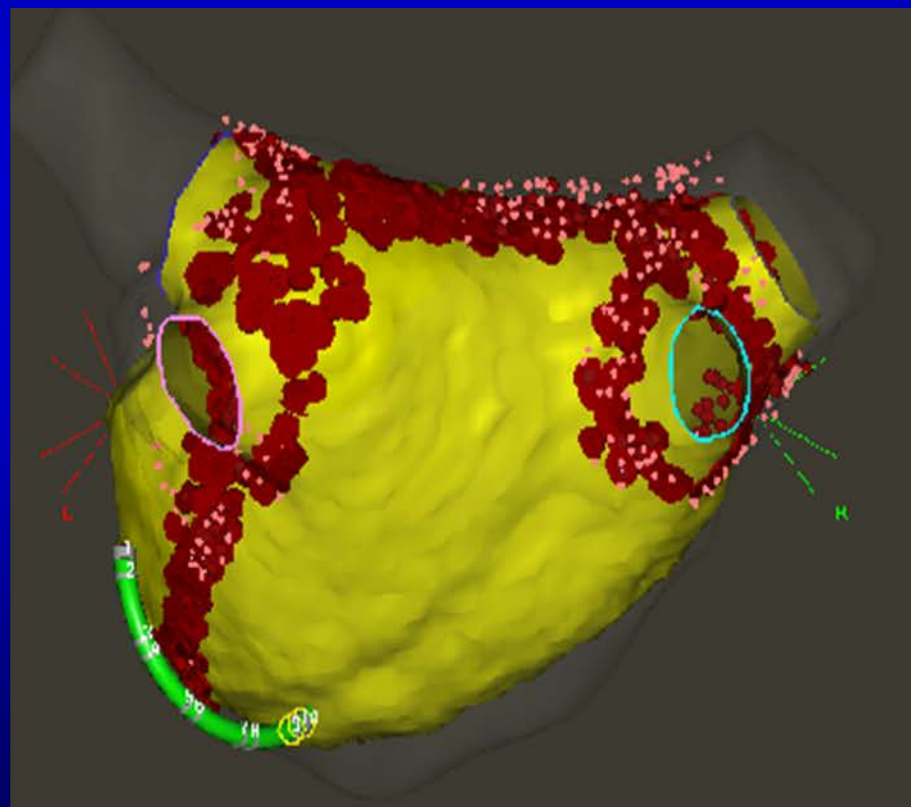
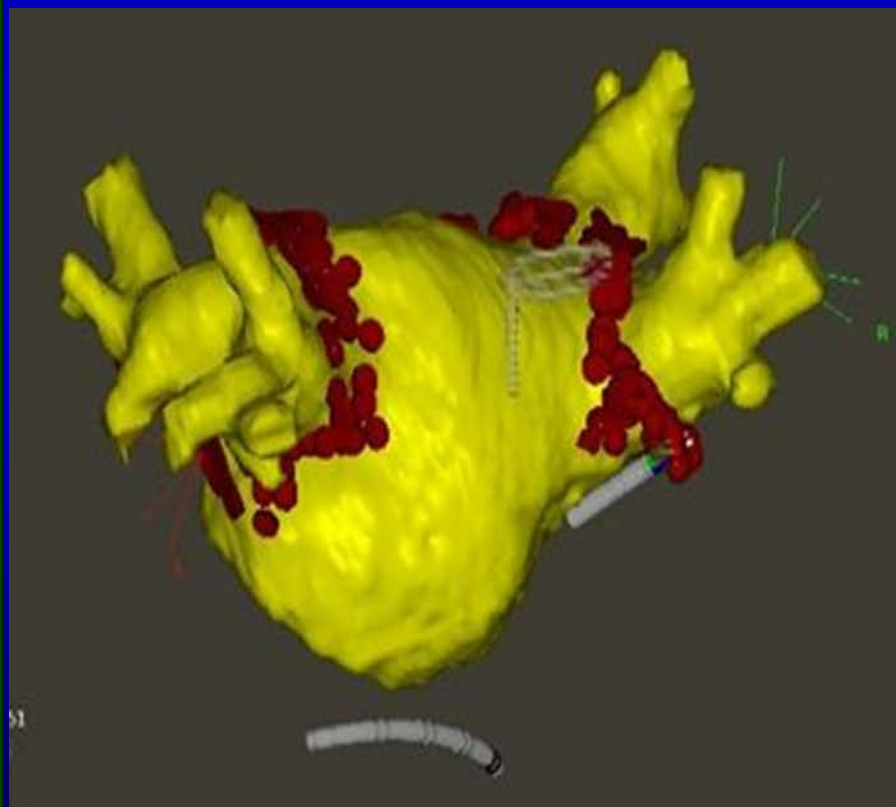


Atrial fibrillation and heart failure



Transcatheter atrial fibrillation ablation in patients with heart failure

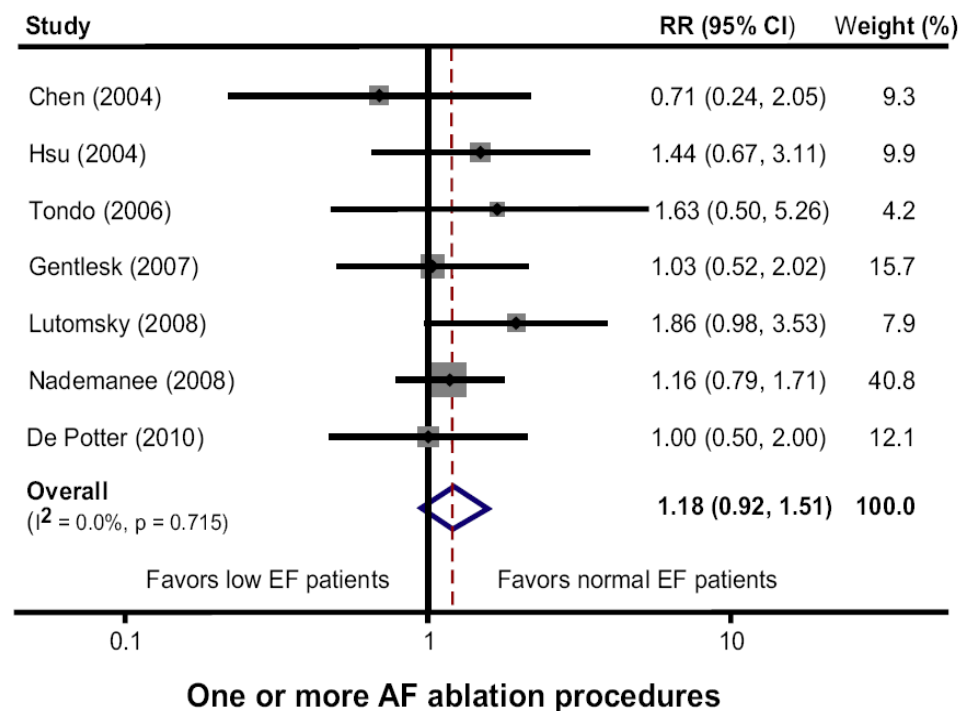
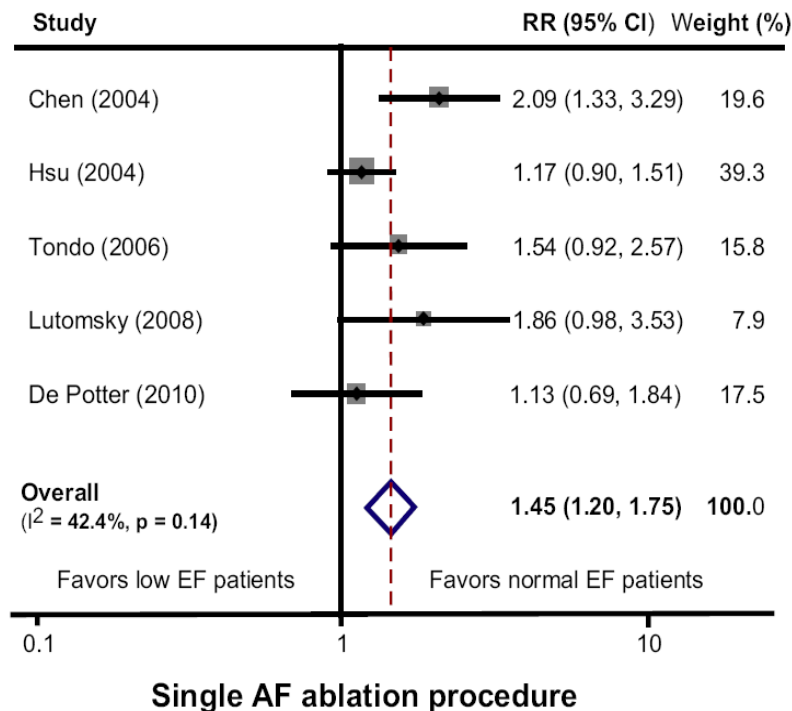
- Pulmonary vein isolation



AF ablation in patients with reduced left ventricular ejection fraction

Author Year	Study design	Size	Summary of findings					Other parameters
			FU	Success (single)	Redo	Success (final)	EF (%)	
Hsu 2004	observ	747	14	54	28	77	35→47	↑LVD, QoL, exercise capacity and NYHA
Chen 2004	observ	94	14	52%	22%	73%	36→41	↑QoL
Tondo 2006	observ	40	14	55%	33%	87%	33→47	↑exercise capacity and QoL
Gentlesk 2007	observ	67	6	55%	31%	86%	42→56	–
Nademanee 2008	observ	129	27	-	21%	79%	30→37	–
Lutomsky 2008	observ	18	6	50%	-	-	41→52	–
Khan 2008	RCT	41	6	78%	10%	88%	27→35	↑QoL and 6MWT
De Potter 2010	observ	36	16	50%	31%	69%	41→58	–
Cha 2011	observ	111	12	-	-	76%	35→56	↑QoL
McDonald 2011	RCT	22	10	50%	-	50%	36→41	↑QoL
Calvo 2013	observ	36	6	70%	31%	83%	41→48	–
Jones 2013	RCT	26	12	68%	19%	88%	21→32	↑ peak oxygen consumption, BNP and QoL
Nedios 2014	observ	69	28	40%	46%	65%	33→53	

Meta-Analysis of AF Catheter Ablation in Patients With Versus Without LV Dysfunction: Risk for recurrent AF or AT



**Risk of recurrences after repeated AF ablation is similar
in patients with versus without LV dysfunction**

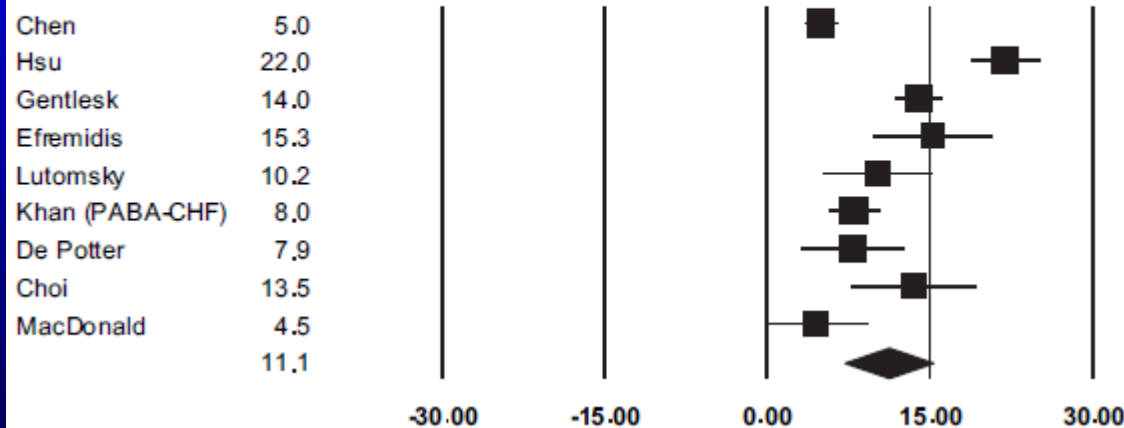
Meta-Analysis of AF Catheter Ablation in Patients With LV Dysfunction:

Author/ study	Publication year	Study type	Patient number	Age (y)	Cutoff (or highest) LVEF (%)	Mean LVEF (%)	Patients with CAD (%)	Type of AF	Follow-up (months)
Chen ²	2004	Cohort study	94	57 ± 8	40	36 ± 8	78	All types of AF	6
Hsu ³	2004	Case-control study	58	56 ± 10	45	35 ± 7	21	All types of AF	12 ± 7
Gentlesk ⁴	2007	Cohort study	67	54 ± 9	50	42 ± 9	18	Paroxysmal and persistent	3–6
Efremidis ⁵	2007	Cohort study	13	54 ± 12	40	36.2 ± 4.6	23	Paroxysmal and persistent	9 ± 4
Lutomsy ⁶	2008	Cohort study	18	56 ± 11	50	41.3 ± 6.5	17	Only paroxysmal	6
Khan (PABA- CHF) ⁷	2008	Randomized trial	41	60 ± 8	40	27 ± 8	73	All types of AF	6
De Potter ⁸	2010	Case-control study	26*	49 ± 10	50	43.2 ± 7.6	19	All types of AF	6
Choi ⁹	2010	Case-control	15	56 ± 11	45	37.1 ± 6.1	33	Paroxysmal and persistent	16 ± 13
MacDonald ¹⁰	2010							ent AF	10 ± 3

**LV EF improved after ablation
by 11.1% (95% CI: 7.1-15.2, p<0 .001)**

Study name

D
in means



AF ablation in heart failure

Long-term outcome



Catheter Ablation of Atrial Fibrillation in Patients with Left Ventricular Systolic Dysfunction:
A Systematic Review and Meta-Analysis

Matteo Anselmino, Mario Matta, Fabrizio D'Ascenzo, T. Jared Bunch, Richard J. Schilling, Ross J. Hunter, Carlo Pappone, Thomas Neumann, Georg Noelker, Martin Fiala, Emanuele Bertaglia, Antonio Frontera, Edward Duncan, Chrishan Nalliah, Pierre Jaïs, Rukshen Weerasooriya, Jon M. Kalman and Fiorenzo Gaita

25 trials and observational studies,
including **1,838** patients
from **9** countries and **3** continents

Baseline characteristics

	<i>Mean value</i>	<i>Lower confidence interval</i>	<i>Upper confidence interval</i>
Age, years	59	51	61
Paroxysmal AF, %	45	41	56
Persistent AF, %	50	35	54
Long-standing persistent, %	5	2	7
Time since first atrial fibrillation diagnosis, months	42	29	46
Time since first heart failure diagnosis, months	27	20	28
Basal pro-BNP (pg/ml)	11,187	678	11,400
Cardiomyopathy			
- Ischemic, %	41	35	46
- Hypertensive, %	10	5	14
- Valvular heart disease, %	10	6	15
- Idiopathic, %	39	35	45
LV ejection fraction, %	40	35	46

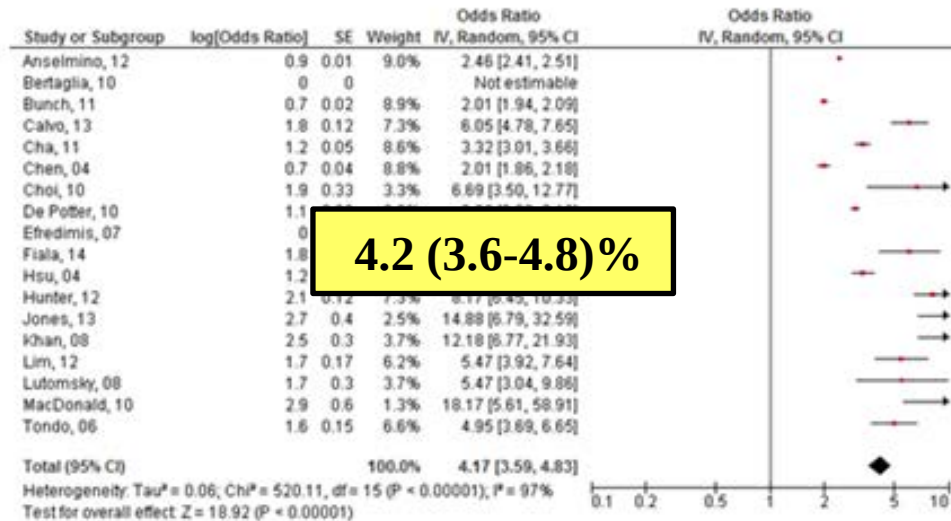
Procedural characteristics

	Mean value	Lower confidence interval	Upper confidence interval
PV isolation, %	100	100	100
PV isolation alone, %	55	51	76
Left isthmus line, %	35	10	50
Roof line, %	46	34	48
CFAE, %	5	1	7
Overall complications, %	4.2	3.6	4.8
Access site complications, %	2.0	1.0	2.1
Stroke/TIA, %	1.0	0.6	1.3
Cardiac tamponade, %	1.2	0.6	1.4

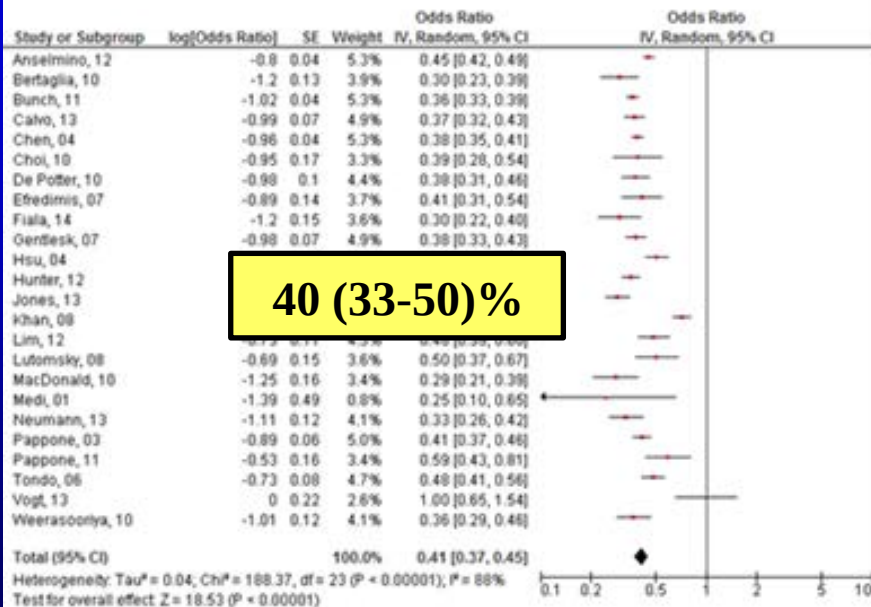
Mean follow-up: **23 (18-40) months**

Redo procedures: **32 (25-38)%**

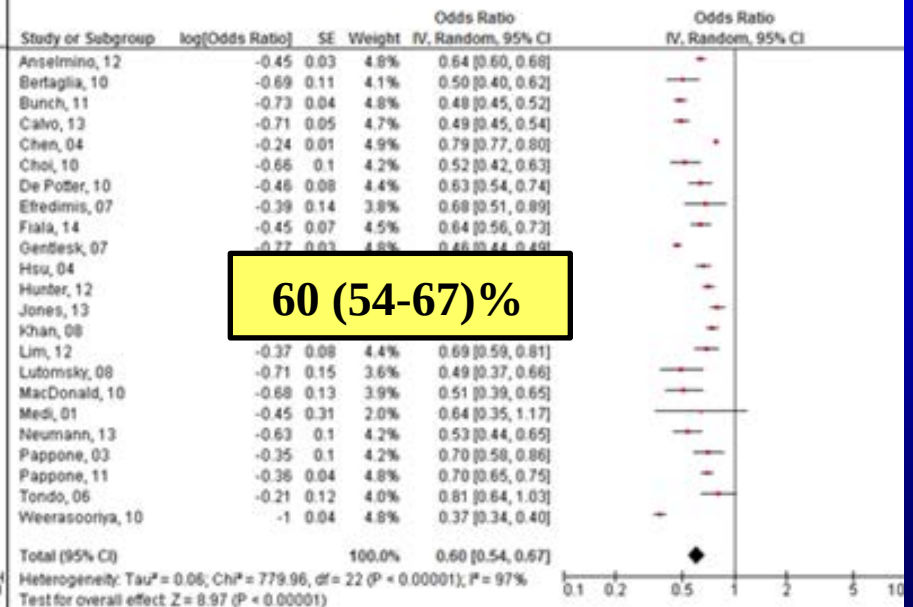
A. Procedural complications



B. Catheter ablation efficacy after the first procedure



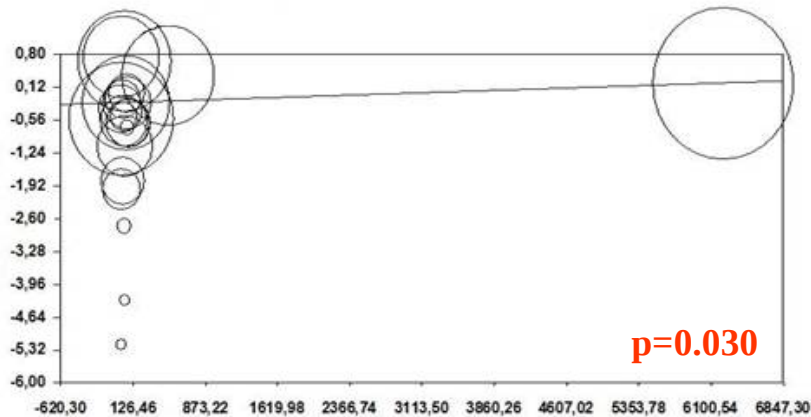
C. Catheter ablation efficacy at the end of follow-up



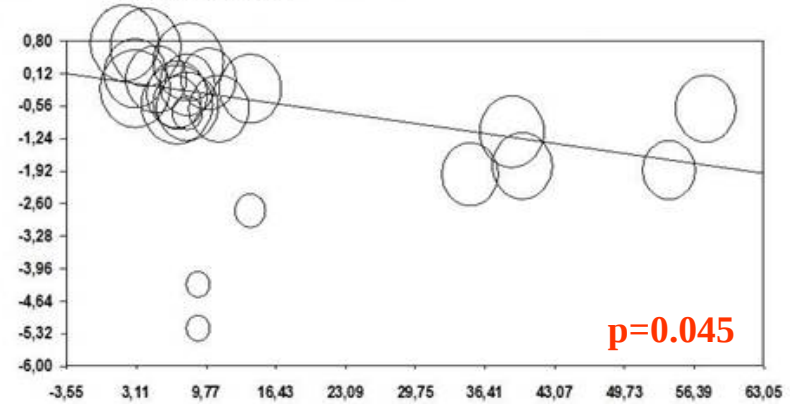
AF ablation in heart failure

Predictors of AF recurrence

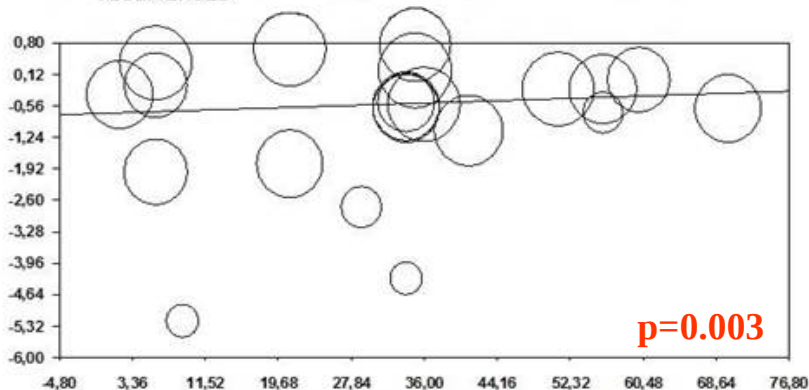
A. Time since first AF diagnosis and risk of AF recurrences



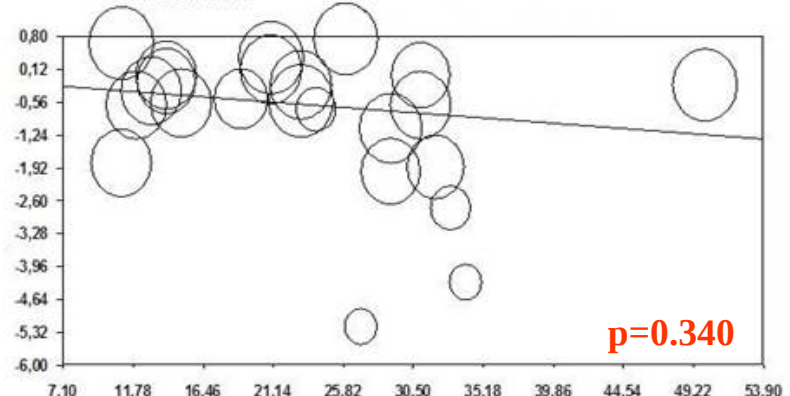
C. Absence of known structural heart disease and risk of AF recurrences



B. Time since first heart failure diagnosis and risk of AF recurrences



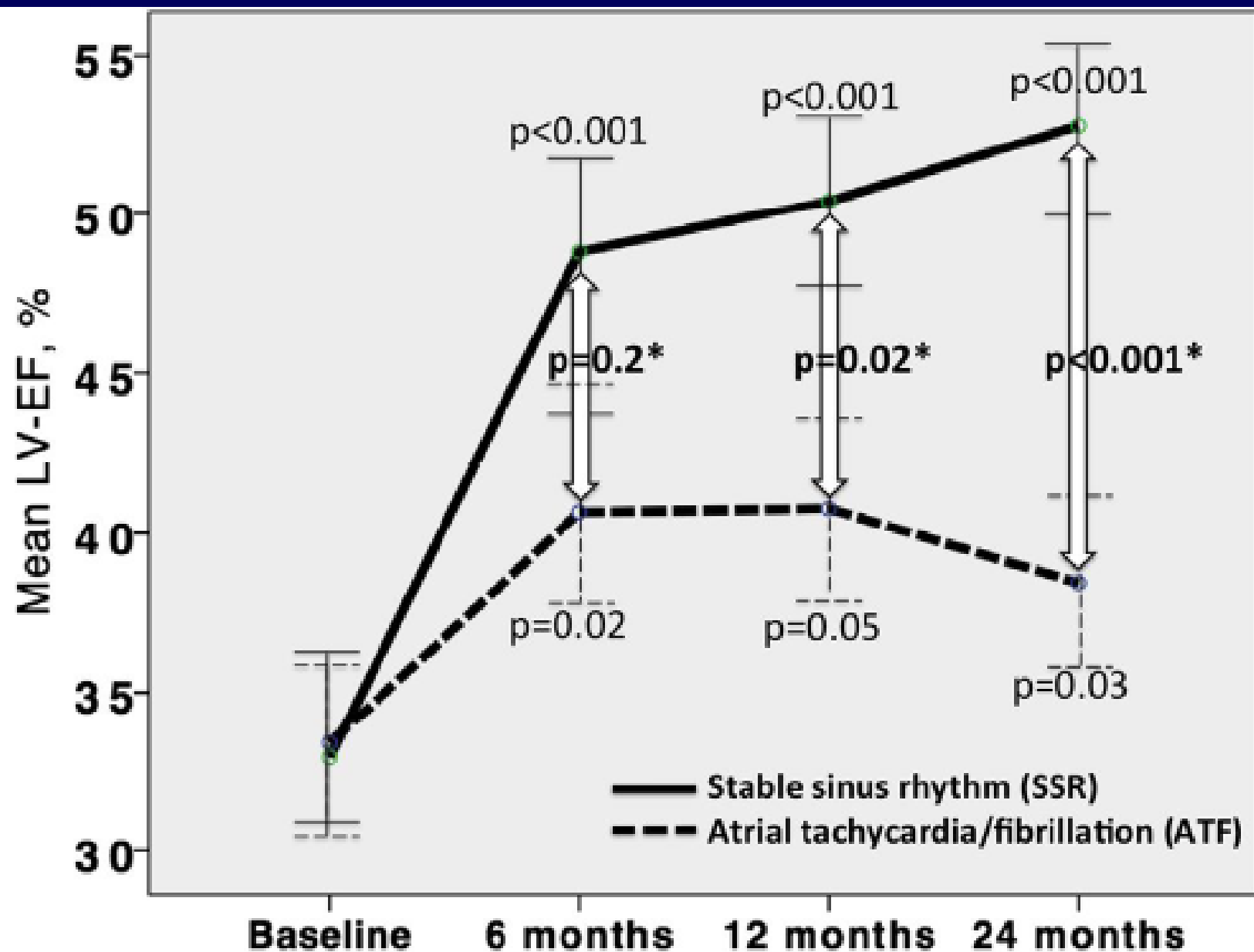
D. Other AFCA strategies than PVI and risk of AF recurrences



AF ablation in heart failure

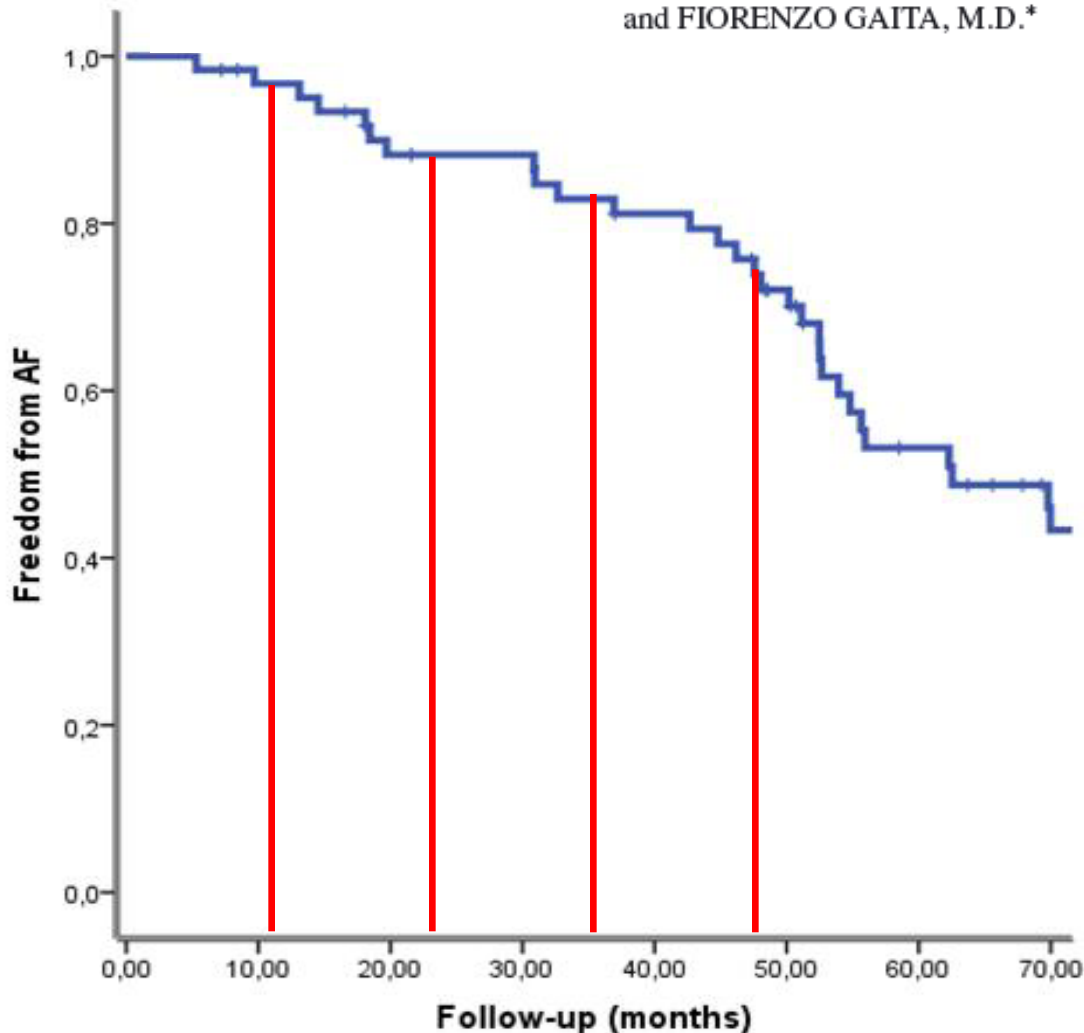
Impact on left ventricular function





Long-Term Results of Transcatheter Atrial Fibrillation Ablation in Patients with Impaired Left Ventricular Systolic Function

MATTEO ANSELMINO, M.D., Ph.D.,* STEFANO GROSSI, M.D.,† MARCO SCAGLIONE, M.D.,‡
DAVIDE CASTAGNO, M.D.,* FRANCESCA BIANCHI, M.D.,† GAETANO SENATORE, M.D.,§
MARIO MATTA, M.D.,* DARIO CASOLATI, M.D.,* FEDERICO FERRARIS, M.D.,*
YVONNE CRISTOFORETTI, M.D.,* ALESSANDRO NEGRO, M.D.,*
and FIORENZO GAITA, M.D.*



196 patients

30% redo

efficacy 62%
relapses 38%

Clinical benefit



↓ one NYHA class



↑ ≥ 10% of FE

	Benefit (n=80)	No benefit (n=90)	p-value
SR maintenance, n (%)	59 (58.4)	42 (41.6)	<0.001
AF recurrence, n (%)	21 (30.4)	48 (69.6)	

At multivariate analysis (adjusted for sinus rhythm maintenance, baseline NYHA class, Hypertrophic cardiomyopathy, AF type, statin therapy and resting heart rate)
OR 4.26 CI95% 1.69-10.74
p=0.002
sinus rhythm maintenance during follow-up was the only parameter independently related to long-term clinical benefit

AF ablation vs CRT + AV node ablation?

Radiofrequency ablation for persistent atrial fibrillation in patients with advanced heart failure and severe left ventricular systolic dysfunction: a randomised controlled trial

Michael R MacDonald,¹ Derek T Connelly,^{1,2} Nathaniel M Hawkins,³ Tracey Steedman,⁴ John Payne,¹ Morag Shaw,⁴ Martin Denvir,⁵ Sai Bhagra,¹ Sandy Small,² William Martin,² John J V McMurray,⁶ Mark C Petrie¹

Heart 2011

A Randomized Trial to Assess Catheter Ablation Versus Rate Control in the Management of Persistent Atrial Fibrillation in Heart Failure

David G. Jones, MD,*† Shouvik K. Halder, MBBS,*† Wajid Hussain, MB, CHB,*† Rakesh Sharma, PhD,*† Darrel P. Francis, MD,† Shelley L. Rahman-Haley, MD,* Theresa A. McDonagh, MD,*† S. Richard Underwood, MD,*† Vias Markides, MD,*† Tom Wong, MD*†

J Am Coll Cardiol 2013

A Randomized Controlled Trial of Catheter Ablation Versus Medical Treatment of Atrial Fibrillation in Heart Failure (The CAMTAF Trial)

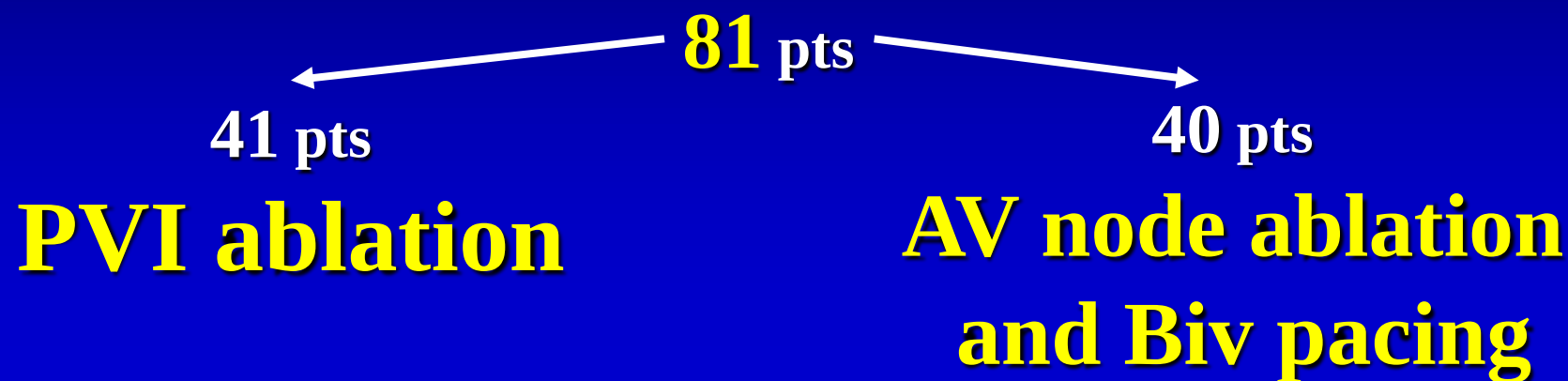
Ross J. Hunter, MRCP, PhD; Thomas J. Berriman, MBBS; Ihab Diab, MD, MRCP; Ravindu Kamdar, MD, MRCP; Laura Richmond, MSc; Victoria Baker, MSc; Farai Goromonzi, MSc; Vinit Sawhney, MRCP; Edward Duncan, MRCP, PhD; Stephen P. Page, MD, MRCP; Waqas Ullah, MRCP; Beth Unsworth, PhD; Jamil Mayet, MD, FESC; Mehul Dhinoja, FRCP; Mark J. Earley, MD, FRCP; Simon Sporton, MD, FRCP; Richard J. Schilling, MD, FRCP

Circ Arrhythm Electrophysiol 2014

Catheter Ablation Versus Rate Control ...

AF ablation vs CRT + AV node ablation

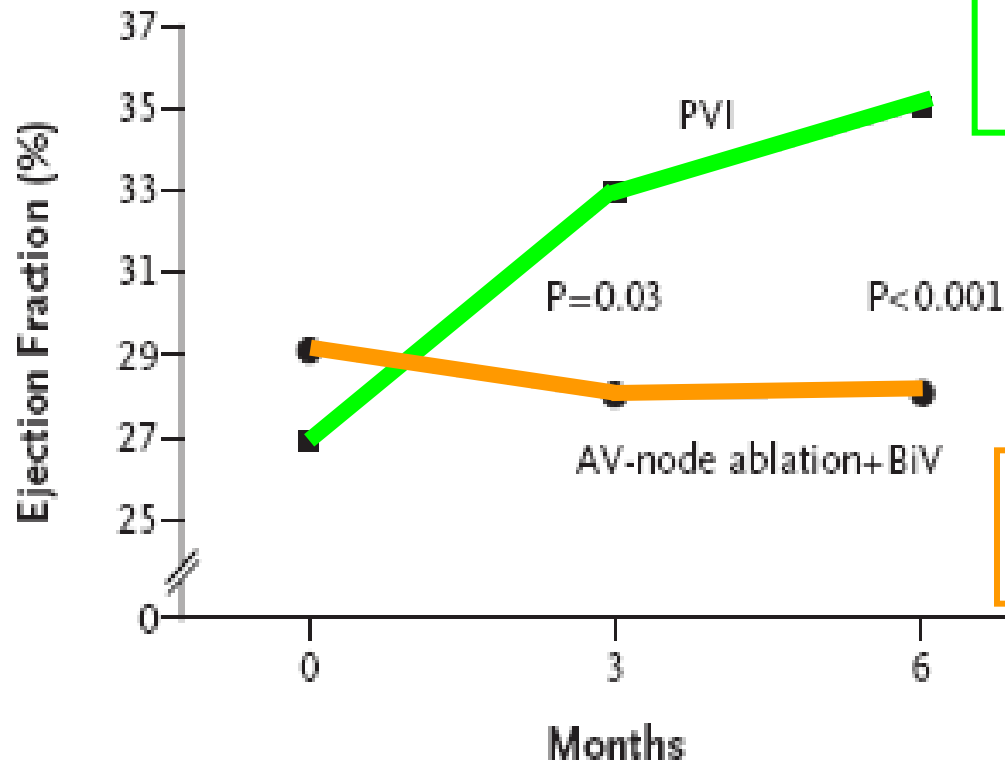
PABA-CHF



Characteristic	Pulmonary-Vein Isolation (N=41)	AV-Node Ablation with Biventricular Pacing (N=40)
Coronary artery disease (%)	73	68
Type of atrial fibrillation (%)		
Paroxysmal	49	54
Persistent or long-standing persistent	51	46
Duration of atrial fibrillation (yr)	4.0±2.4	3.9±2.8
Ejection fraction (%)	27±8	29±7
Left atrial internal diameter (cm)	4.9±0.5	4.7±0.6

PVs ISOLATION

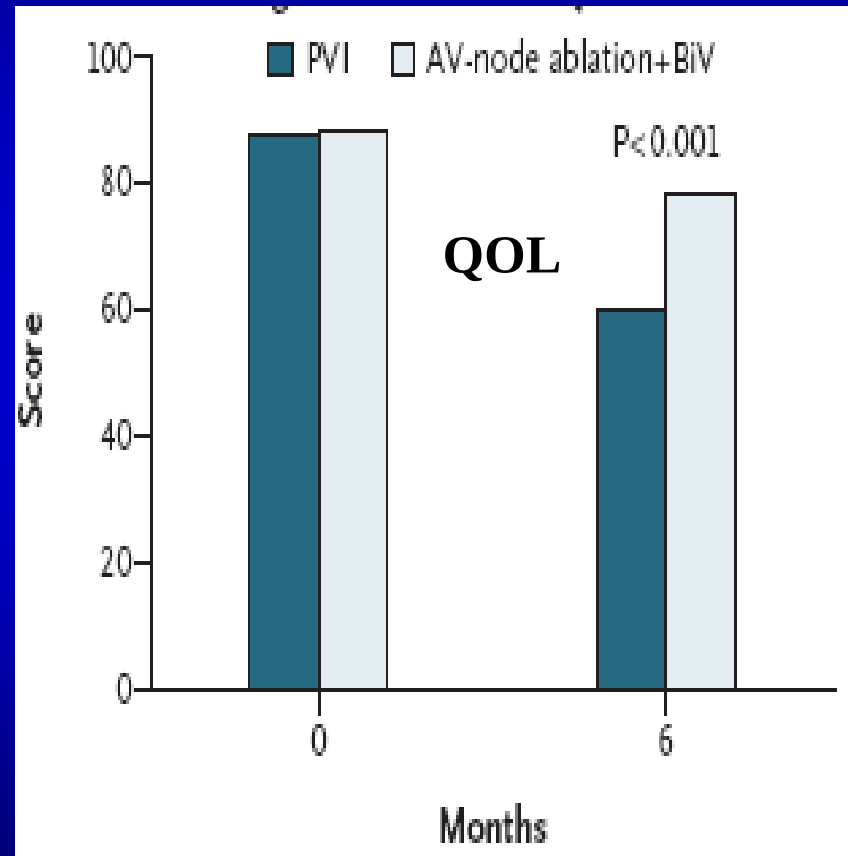
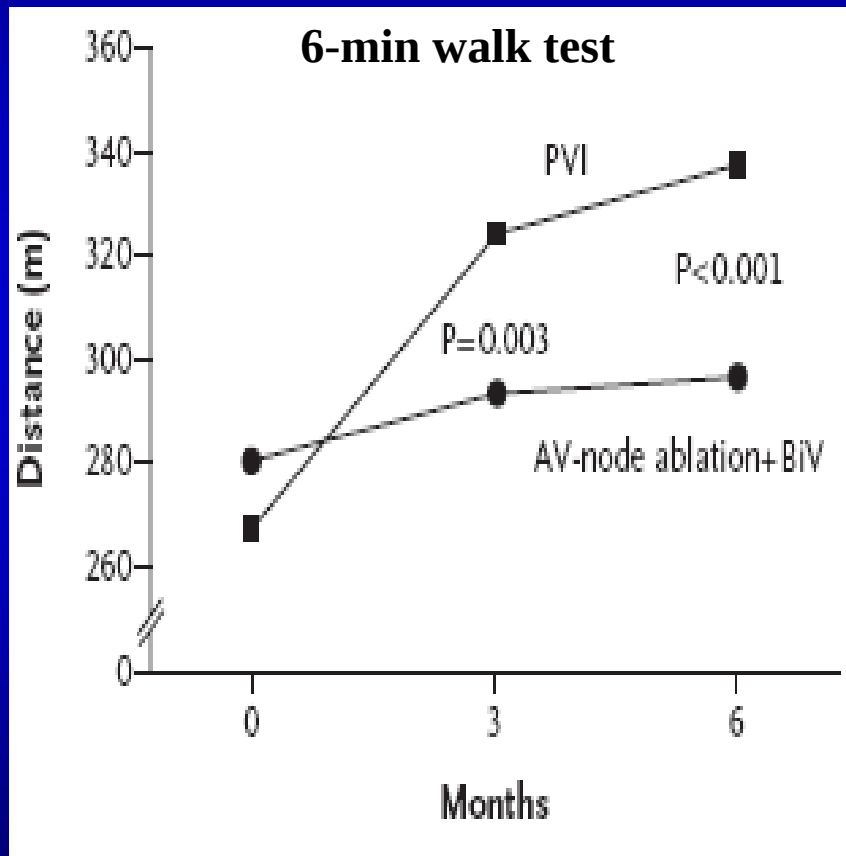
EF improved in 76% of patients
Improvement in EF by $8 \pm 8\%$



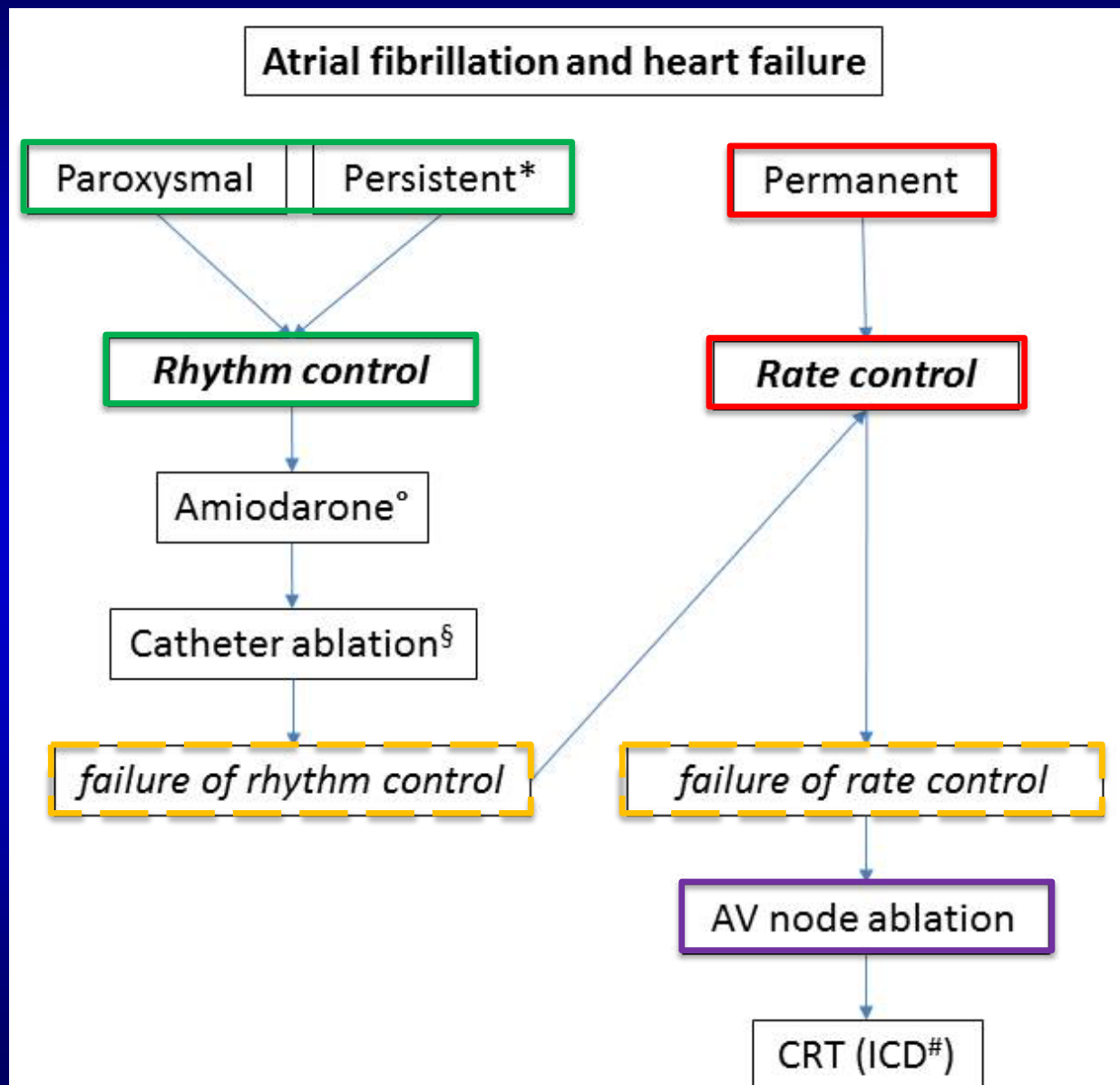
AV-node ablation+BIV

Decrease in EF by $1 \pm 4\%$
EF improved in only 25% of pts

Pulmonary-vein isolation improved functional capacity (6-minute walk test) and QOL



European Heart Rhythm Association/Heart Failure Association joint consensus document on Arrhythmias in Heart Failure



Who to refer to atrial fibrillation ablation?

- Paroxysmal AF
- Persistent AF below 6 months
- Left atrium volume < 150/160 ml

Propose AF ablation at the earliest stage possible!

...in case of atrial fibrillation ablation...

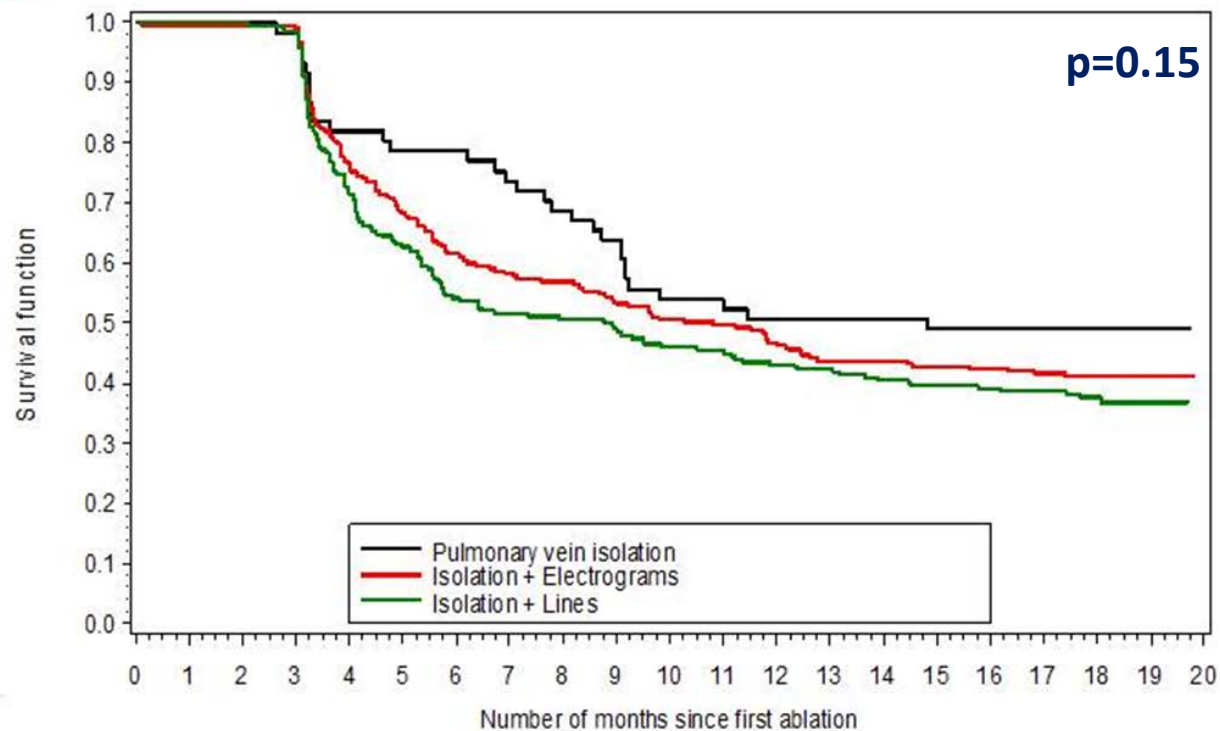
Comparison of ThermoCool® Surround Flow Catheter Versus ThermoCool® Catheter in Achieving Persistent Electrical Isolation of Pulmonary Veins: A Pilot Study

EMANUELE BERTAGLIA, M.D.,* GAETANO FASSINI, M.D.,†
 MATTEO ANSELMINO, M.D., Ph.D.,‡ GIUSEPPE STABILE, M.D.,§
 GIUSEPPE GRANDINETTI, M.D.,¶ ANTONIO DE SIMONE, M.D.,**
 LEONARDO CALÒ, M.D.,†† CLAUDIO PANDOZI, M.D.,‡‡ CLAUDIO PRATOLA, M.D.,§§
 FRANCO ZOPPO, M.D.,* CLAUDIO TONDO, M.D., Ph.D.,† ASSUNTA IULIANO, M.D.,§
 and FIORENZO GAITA, M.D., Ph.D.‡

<u>Patients with isolated PV 30 minutes after CA (%)</u>	45/54 (83.3)	37/52(71.2)	.13
<u>Volume of infused saline solution, ml</u>	752.7±268.6	1165.9±436.2	<u><.0001</u>
Fluoroscopy time during RF CA, seconds	342.2±374.0	437.3±479.9	.26
Fluoroscopy time during w		813.9±730.1	.50
Procedural time during RF		64.0±28.0	.34
Procedural time during wh		106.2±36.1	.75
Complications (%)		2/54 (3.84%)	.003



...and PVI only?...



No. at Risk

Pulmonary vein isolation	81	60	50	41	36	23
Isolation + Electrograms	244	242	181	137	124	72
Isolation + Lines	244	240	152	133	115	57

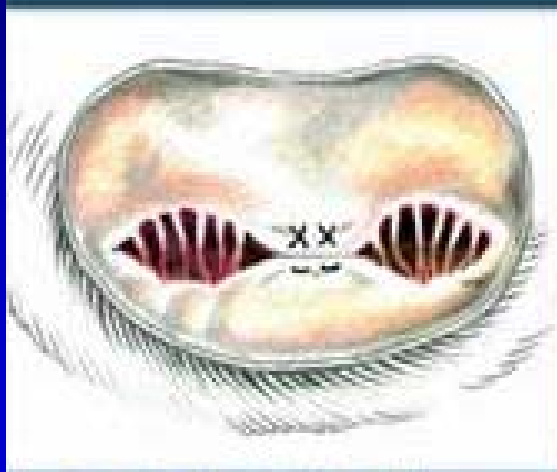
Documented AF > 30 seconds after one procedure with or without AAD

Who to refer to AV node ablation + CRT?

- Permanent AF + large left atrial volume + uncontrolled heart rate (despite optimal pharmacological treatment)**
- CRT indication + low pacing percentage (due to AF)**

AV node ablation + CRT only as late stage strategy!

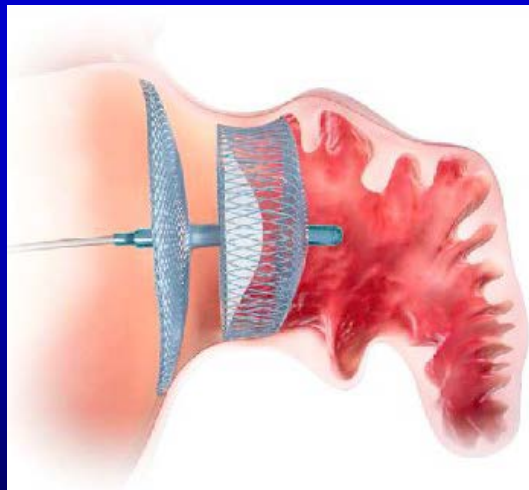
**...for late stage: consider also
more comprehensive approaches?**



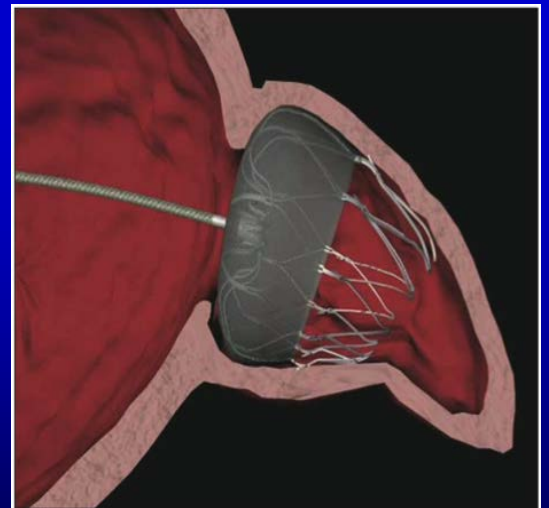
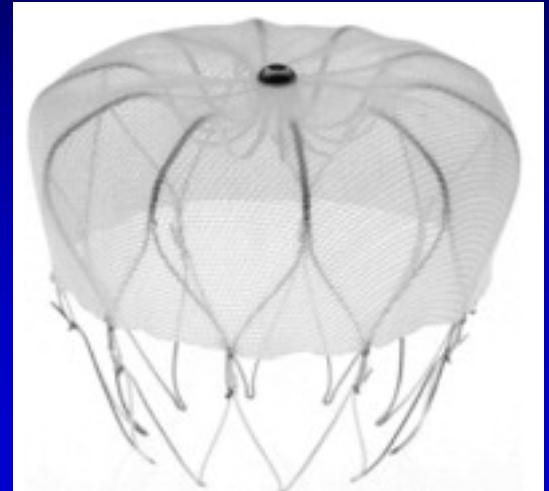
PLAATO



ACP



WATCHMAN



Interventional solutions in AF and HF

Drug therapy is to date the **first and most used** approach but achieves **poor results** and **side effects**

AF ablation presents similar outcome than in the general population and should be considered the **first interventional option** (at the **early stage**) to improve **EF and symptoms**

AV node ablation + CRT may be considered in **late stage** AF in selected cases

Thanks for your attention!

