FAKULTNÍ NEMOCNICE® OLOMOUC

Lékařská fakulta
Univerzita Palackého v Olomouci

KOMPLEXNÍ KARDIOVASKULÁRNÍ CENTRUM
FAKULTNÍ NEMOCNICE OLOMOUC

Role of catheter ablations in patients with heart failure

Tomáš Skála

AF and HF – pathophysiology

AF in HF → 10–57% (dep. on HF severity)

HF in AF (persistent/long-standing persistent) → 40-55%

Santhanakrishnan R. Circulation 2016

Increased risk of mortality synergistically confer worse outcomes compared with either condition alone

↑ *rates of stroke, HF hospitalization, and death*

Mamas MA, Eur J Heart Fail 2009

AF → HF

loss of atrial contraction to ventricular filling - ↓ diastolic function and ↓ CO by up to 25%

uncontrolled rapid ventricular conduction - impaired myocardial contractility - LV systolic dysfunction - tachycardia-induced CMP

irregular ventricular conduction - itself ↓CO

Nerheim P, Circulation 2004

HF → AF

ventricular dysfunction → atrial structural and electrical changes by several hemodynamic, mechanical, and neurohormonal mechanisms → atrial stretch and fibrosis → AF

Li D, Circulation 2001

…vicious electromechanical cycle between AF and HF…

AF and HF – what to do?

Drugs:

1. *Rhythm control* – pharmacological
2. Permanent AF, pharmacological *rate-control*

Devices and interventions (non-pharmacological):

3. Rhythm control – complex *catheter ablation*
4. Permanent AF, *pace and ablate*

Rate vs. pharmacological rhythm control (general population)

8 RCTs (7,499 patients)

no significant differences in

all-cause mortality (RR: 0.95; CI: 0.86–1.05)

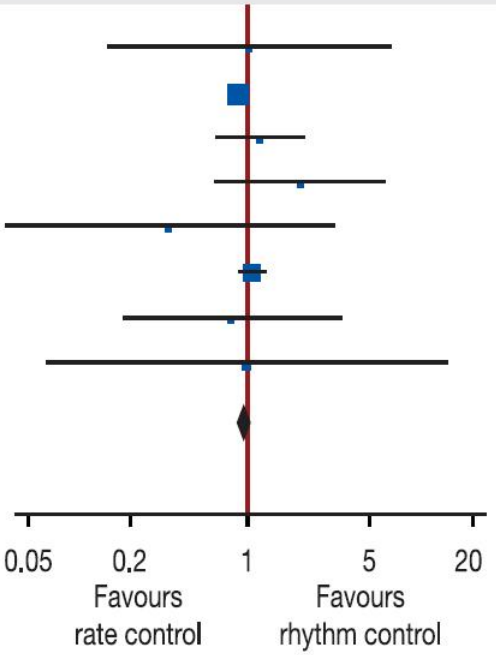
CV mortality (RR: 0.99; CI: 0.87–1.13)

sudden death (RR:1.12; CI: 0.91–1.38)

Study or subgroup	Rate control Events	Total	Rhythm control Events	Total	Weight	Risk ratio M-H, Random, 95% CI	Year
PIAF	2	125	2	127	0.3%	1.02 [0.15, 7.10]	2000
AFFIRM	310	2027	356	2033	52.1%	0.87 [0.76, 1.00]	2002
RACE	21	256	19	266	2.8%	1.15 [0.63, 2.09]	2002
STAF	8	100	4	100	0.7%	2.00 [0.62, 6.43]	2003
HOT CAFE	1	101	3	104	0.2%	0.34 [0.04, 3.25]	2004
AF-CHF	228	694	217	682	43.2%	1.03 [0.89, 1.20]	2008
J-RHYTHM	3	404	4	419	0.5%	0.78 [0.18, 3.45]	2009
CAFE-II	1	31	1	30	0.1%	0.97 [0.06, 14.78]	2009
Total (95% CI)	**3738**		**3761**		**100.0%**	**0.95 [0.86, 1.05]**	
Total events	574		606				

Heterogeneity : $Tau^2 = 0.00$; $Chi^2 = 3.57$, df = 7 ($P = 0.61$); $I^2 = 0\%$

Test for overall effect : Z = 0.99 ($P = 0.32$)



Rate vs. pharmacological rhythm control (heart failure patients)

AF-CHF study

1,376 patients

AF (33% paroxysmal, 67% persistent)

NYHA II-IV

LVEF < 35%

pharmacologic rhythm control (mostly amiodarone) vs. **pharmacologic rate control**

FU 47 months, SR:

pharmacologic rhythm control	73%
rate control	35%

Rate vs. pharmacological rhythm control

AF-CHF study

no difference in:

cardiovascular mortality (HR 1.06, 95% CI 0.86–1.30; P = 0.59)

worsening HF (HR 0.87, 95% CI 0.72–1.06, P = 0.17)

all-cause mortality (HR 0.97, 95% CI 0.80–1.17, P = 0.73)

(similar to the AFFIRM trial)

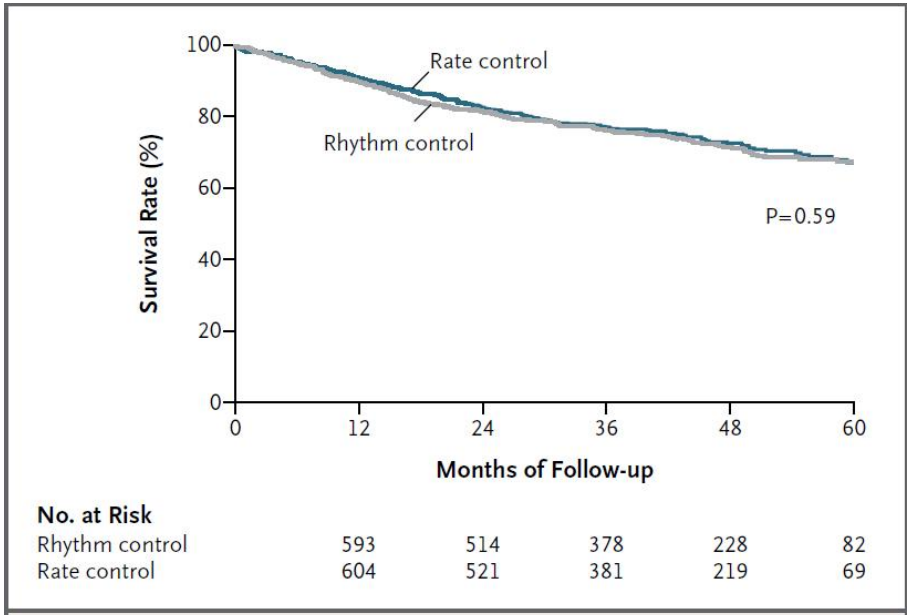


Figure 2. Kaplan–Meier Estimates of Death from Cardiovascular Causes (Primary Outcome).

Among 1376 patients with atrial fibrillation and congestive heart failure who were followed for a mean of 37 months, 182 patients (27%) in the rhythm-control group died from cardiovascular causes, as compared with 175 patients (25%) in the rate-control group (hazard ratio, 1.06; 95% confidence interval, 0.86 to 1.30).

amiodarone

associated with a high discontinuation rate and its use is suggested to be associated with↑non-CV death

Steinberg JS, Circulation, 2004

In some HF patients, we can achieve SR with amiodarone.

But compared with patients left on rate-control, we will not lower their mortality.

Non-pharmacological rhythm-control

Trial (year of publication)	N	Inclusion criteria	Treatment arms	Primary endpoint	FU (months)	Main observations
PABA-CHF (2008)[56]	81	Paroxysmal or persistent AF, NYHA II–III, and LVEF ≤40%	PVI (± additional ablation) vs. CRT plus AV node ablation	Composite of LVEF (echo), 6MWD or MLWHF score	6	88% AF-free survival in ablation arm (71% off AAD); significant increase in LVEF (+8 vs. -1%), functional capacity, and QOL
MacDonald *et al.* (2011)[57]	41	Persistent AF, NYHA II–IV, and LVEF <35%	PVI (± additional ablation) vs. pharmacological rate control	Change in LVEF (MRI)	6	50% AF-free survival in ablation arm (50% off AAD); non-significant increase in LVEF (significant if sinus rhythm: +10 vs. +1%), functional capacity, and QOL
ARC-HF (2013)[58]	52	Persistent AF, NYHA II–IV, and LVEF ≤35%	PVI (± additional ablation) vs. pharmacological rate control	Change in peak oxygen consumption	12	88% AF-free survival in ablation arm (84% off AAD); significant improvement in peak VO_2, QOL, and BNP; non-significant increase in LVEF (+11 vs. +5%) and 6MWD
CAMTAF (2014)[59]	50	Persistent AF, NYHA II–IV, and LVEF <50%	PVI (± additional ablation) vs. pharmacological rate control	Change in LVEF (echo)	6	81% AF-free survival in ablation arm (81% off AAD); significant improvement in LVEF (+8 vs. -3%), functional capacity, QOL, and BNP
AATAC-AF (2016)[60]	203	Persistent AF, NYHA II–III, LVEF ≤40%, and DC-ICD/CRT-D	PVI (± additional ablation) vs. amiodarone	AF-free survival	24	70% AF-free survival in ablation arm (on/off AAD) vs. 34% in amiodarone arm; significant improvement in LVEF (+8 vs. +6%), mortality (8 vs. 18%), hospitalization (31 vs. 57%), and QOL
CAMERA-MRI (2017)[33]	68	Persistent AF, NYHA II-IV, LVEF ≤45%, and idiopathic cardiomyopathy[a]	PVI + posterior box isolation vs. pharmacological rate control	Change in LVEF (MRI)	6	75% AF-free survival in ablation arm (56% off AAD); significant improvement in LVEF (+18 vs. +4%) and LVEF normalization ≥50% (58 vs. 9%); LGE - predicted LVEF improvement and normalization
CASTLE-AF (2018)[61]	363	Paroxysmal or persistent AF, NYHA II–IV, LVEF ≤35%, and DC-ICD/CRT-D with remote monitoring	PVI (± additional ablation) vs. pharmacological rate (70%) or rhythm control (30%)	Composite of HF hospitalization or all-cause mortality	60 (median 38)	63 vs. 22% maintained SR at 5 years; significant improvement in LVEF (+8 vs. 0%), all-cause mortality or HF hospitalization (28 vs. 44%), all-cause mortality (13 vs. 25%), cardiovascular mortality (11 vs. 22%), and HF hospitalization (21 vs. 36%)

Non-pharmacological rhythm-control

Journal of the American College of Cardiology
© 2013 by the American College of Cardiology Foundation
Published by Elsevier Inc.
Vol. 61, No. 18, 2013
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2013.01.069

Heart Rhythm Disorders

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. Haldar, 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*†
London, United Kingdom

ARC-CHF

AF ablation vs. **pharmacological rate control**

persistent AF, LV dysfunction

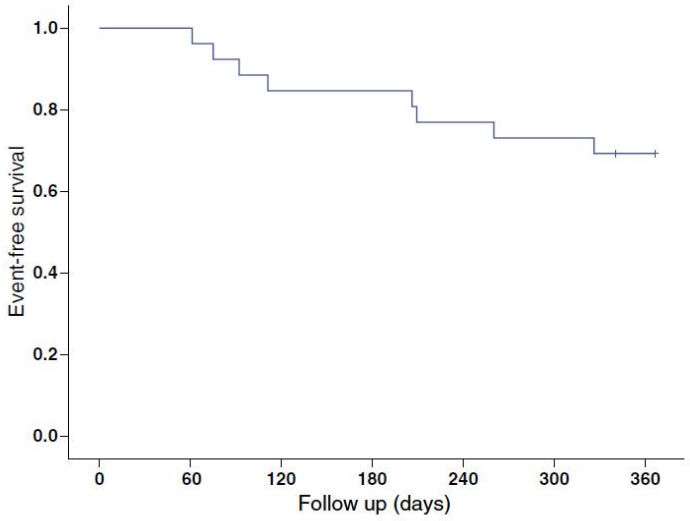


Figure 6 **Single Procedure Atrial Arrhythmia-Free Survival at 1 Year**

Intention-to-treat Kaplan-Meier atrial arrhythmia-free survival estimation after a single ablation procedure. The blanking period was set at 2 months, after which occurrence of documented atrial tachyarrhythmia constituted procedural failure.

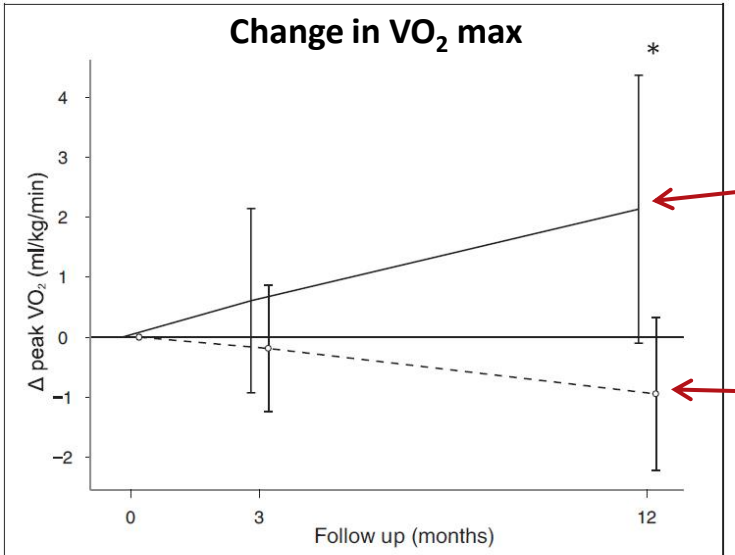


Figure 2 **Primary Endpoint: Summary Data**

By intention-to-treat, change (Δ) in peak oxygen consumption (VO_2) (mean ± 95% confidence interval) from baseline, comparing ablation **(solid dot/line)** versus rate control **(open dot and dashed line)** at 3- ($p = 0.38$) and 12-month ($p = 0.018$) follow-up. Statistical significance shown between groups at each time point: *if $p < 0.05$.

Non-pharmacological rhythm-control

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

CAMTAF

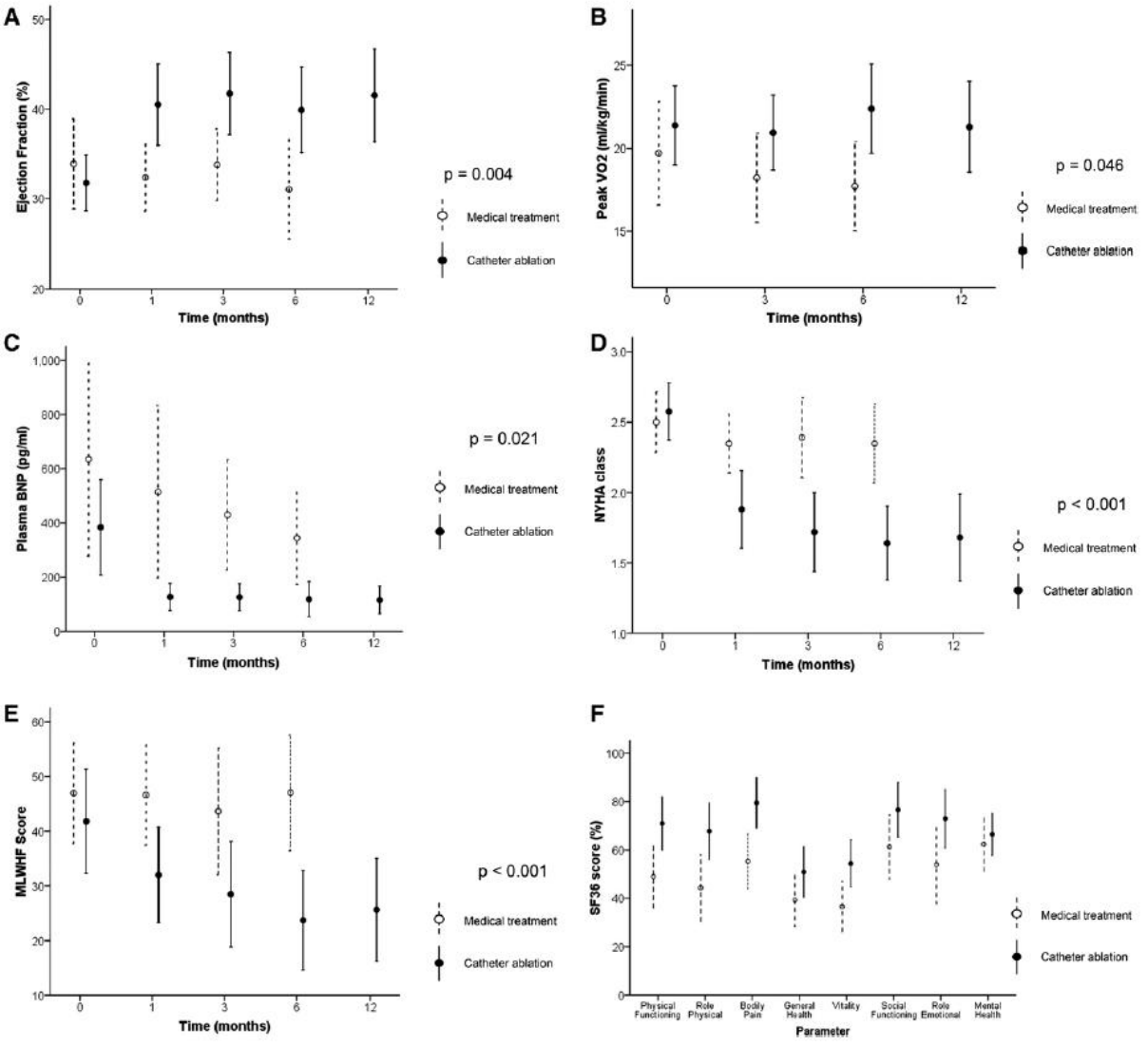
AF ablation

vs.

pharmacological rate control

persistent Af, LV dysfunction

↑ LVEF (+8% vs. -3%; P< 0.001)



…Ablation is better than rate-control in improvement of objective signs of HF…

Non-pharmacological rhythm-control

Ablation Versus Amiodarone for Treatment of Persistent Atrial Fibrillation in Patients With Congestive Heart Failure and an Implanted Device

Results From the AATAC Multicenter Randomized Trial

Luigi Di Biase, MD, PhD; Prasant Mohanty, MBBS, MPH; Sanghamitra Mohanty, MD; Pasquale Santangeli, MD; Chintan Trivedi, MD, MPH; Dhanunjaya Lakkireddy, MD; Madhu Reddy, MD; Pierre Jais, MD; Sakis Themistoclakis, MD; Antonio Dello Russo, MD; Michela Casella, MD; Gemma Pelargonio, MD; Maria Lucia Narducci, MD; Robert Schweikert, MD; Petr Neuzil, MD; Javier Sanchez, MD; Rodney Horton, MD; Salwa Beheiry, RN; Richard Hongo, MD; Steven Hao, MD; Antonio Rossillo, MD; Giovanni Forleo, MD; Claudio Tondo, MD; J. David Burkhardt, MD; Michel Haissaguerre, MD; Andrea Natale, MD

AATAC-AF

AF ablation vs. **amiodarone**

203 patients

persistent AF

NYHA II–III

LVEF <40%

FU 2 years, *(1.4± 0.6 procedures)*

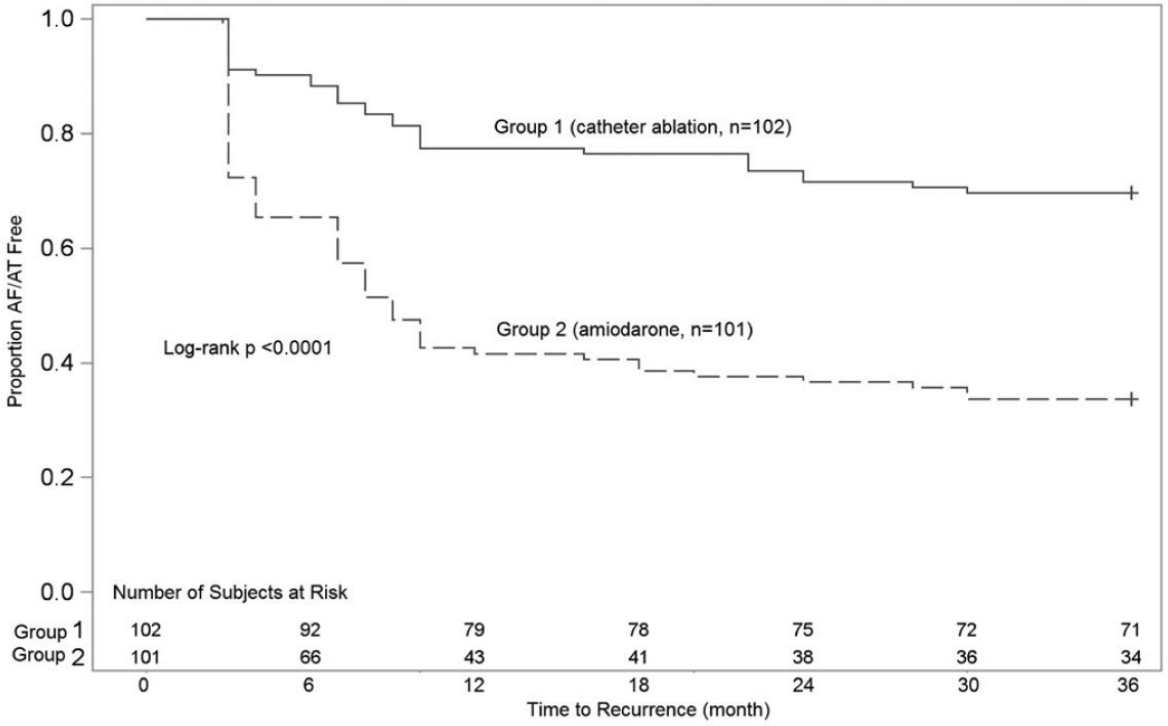
Arrhythmia-free:

AF ablation	70%
amiodarone	34%

Mortality:

AF ablation	8%
amiodarone	18 %

(P=0.037*)*



…ablation is superior to amiodarone in maintaining of SR and in lowering of mortality rate…

Non-pharmacological rhythm-control

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 FEBRUARY 1, 2018 VOL. 378 NO. 5

Catheter Ablation for Atrial Fibrillation with Heart Failure

Nassir F. Marrouche, M.D., Johannes Brachmann, M.D., Dietrich Andresen, M.D., Jürgen Siebels, M.D., Lucas Boersma, M.D., Luc Jordaens, M.D., Béla Merkely, M.D., Evgeny Pokushalov, M.D., Prashanthan Sanders, M.D., Jochen Proff, B.S., Heribert Schunkert, M.D., Hildegard Christ, M.D., Jürgen Vogt, M.D., and Dietmar Bänsch, M.D., for the CASTLE-AF Investigators*

CASTLE-AF

AF ablation vs. **medication** (rate or rhythm control)

rate-control 70%, amiodarone 30%

primary end-point: all-cause mortality and hospitalization for worsening HF

363 patients; paroxysmal or persistent AF

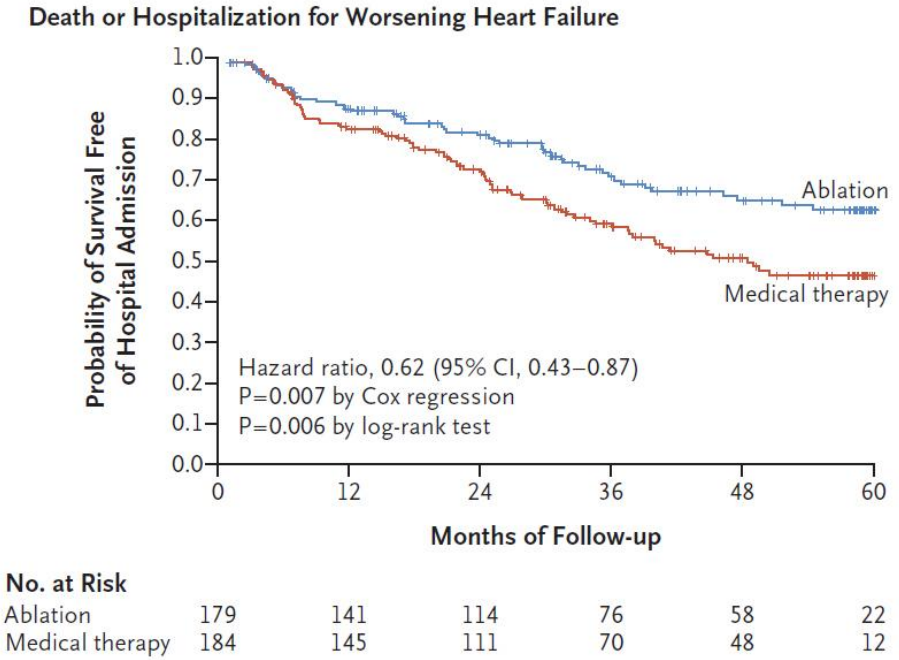
NYHA II–IV; LVEF <35%

FU 5 years

death from any cause (13.4% vs. 25.0%)

heart failure hospitalization (20.7% vs. 35.9%)

NNT 8.3 patients to prevent one primary outcome event



…AF ablation is better then any medication (rate or rhythm control) in lowering of mortality rate…

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Non-pharmacological rhythm-control

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CASTLE-AF

ablation-based rhythm control vs. **medication**

(rate-control 70% or amiodarone 30%)

SR in 63% of cases at 5 years

catheter ablation ↓ AF burden …

Ablation: AF burden 27%

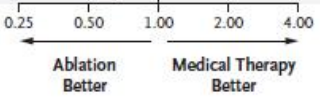
Medical th: AF burden 64%

LVEF >25% more likely to benefit from AF ablation

68% of patients in the ablation group ↑LVEF

beyond the magical cut-off of 35%...

Subgroup	Ablation	Medical Therapy	Hazard Ratio (95% CI)	P Value for Interaction
	no. of events/no. of patients			
Type of atrial fibrillation				0.90
Paroxysmal	17/54	34/64	0.60 (0.34–1.08)	
Persistent	34/125	48/120	0.64 (0.41–0.99)	
CRT–D implanted				0.60
No	37/131	57/132	0.65 (0.43–0.98)	
Yes	14/48	25/52	0.54 (0.28–1.04)	
ICD indication				0.20
Primary	43/160	72/163	0.57 (0.39–0.83)	
Secondary	8/19	10/21	1.03 (0.41–2.62)	
Sex				0.36
Female	9/23	12/29	0.93 (0.39–2.21)	
Male	42/156	70/155	0.58 (0.39–0.84)	
Age				0.17
<65 yr	18/96	34/99	0.48 (0.27–0.85)	
≥65 yr	33/83	48/85	0.79 (0.50–1.23)	
NYHA functional class				0.06
II	20/101	46/109	0.42 (0.25–0.72)	
III	22/50	26/49	0.89 (0.51–1.58)	
LVEF				0.01
<25%	20/34	15/27	1.36 (0.69–2.65)	
≥25%	29/130	61/145	0.48 (0.31–0.74)	
Cause of heart failure				0.56
Nonischemic	26/107	29/88	0.74 (0.43–1.25)	
Ischemic	25/72	53/96	0.60 (0.37–0.97)	
Diabetes				0.06
No	32/136	48/117	0.52 (0.33–0.81)	
Yes	19/43	34/67	1.01 (0.58–1.78)	
Hypertension				0.88
No	12/50	19/48	0.59 (0.28–1.21)	
Yes	39/129	63/136	0.63 (0.42–0.93)	
Amiodarone use				0.66
No	37/122	61/133	0.65 (0.43–0.97)	
Yes	13/55	18/46	0.55 (0.27–1.13)	
Digitalis use				0.68
No	41/146	52/124	0.65 (0.43–0.98)	
Yes	9/31	27/56	0.56 (0.26–1.19)	
Beta-blocker use				0.47
No	4/12	4/9	1.01 (0.25–4.05)	
Yes	46/165	75/171	0.60 (0.42–0.87)	



Non-pharmacological rhythm-control

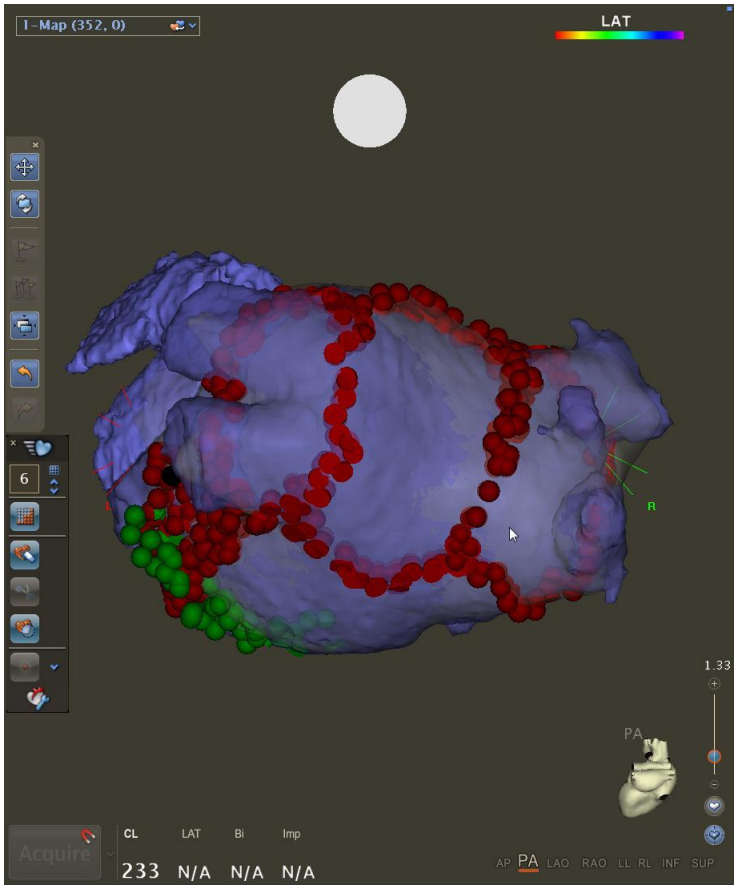
Catheter Ablation Versus Medical Rate Control in Atrial Fibrillation and Systolic Dysfunction

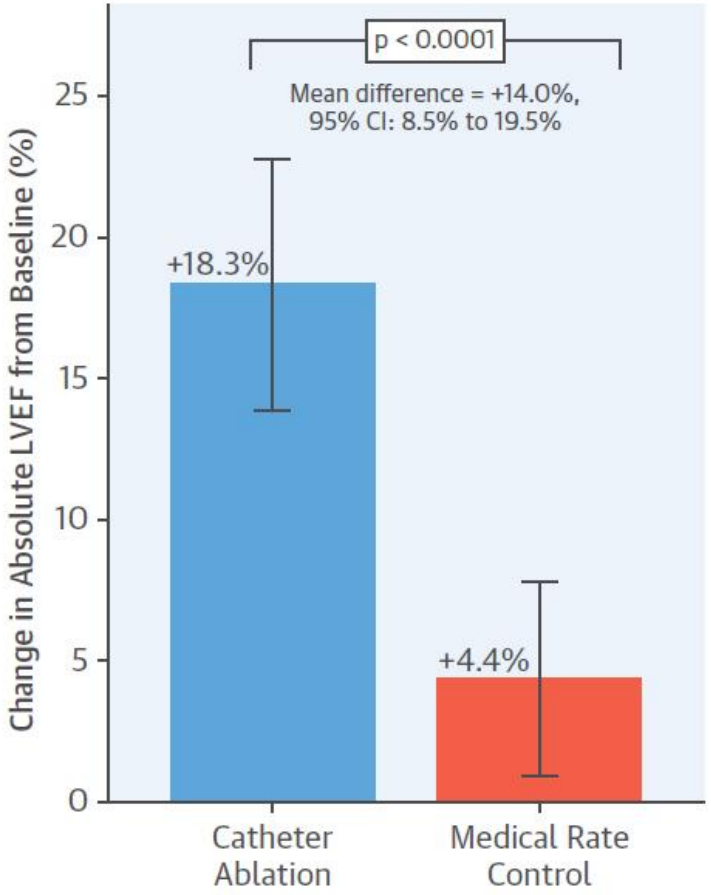
The CAMERA-MRI Study

Sandeep Prabhu, MBBS,[a,b,c,d] Andrew J. Taylor, MBBS, PsD,[a,b,e] Ben T. Costello, MBBS,[a,b] David M. Kaye, MBBS, PhD,[a,b,e] Alex J.A. McLellan, MBBS, PhD,[a,b,c,d] Aleksandr Voskoboinik, MBBS,[a,b,c,d] Hariharan Sugumar, MBBS,[a,b,c,d] Siobhan M. Lockwood, MBBS,[f] Michael B. Stokes, MBBS,[f] Bhupesh Pathik, MBBS,[c,d] Chrishan J. Nalliah, MBBS,[c,d] Geoff R. Wong, MBBS,[c,d] Sonia M. Azzopardi, RN,[a,b] Sarah J. Gutman, MBBS,[a,b] Geoffrey Lee, MBBS, PhD,[c] Jamie Layland, MBCHB, PhD,[e] Justin A. Mariani, MBBS, PhD,[a,b,d] Liang-han Ling, MBBS, PhD,[a,b,d] Jonathan M. Kalman, MBBS, PhD,[c,d] Peter M. Kistler, MBBS, PhD[a,b,d]

CAMERA-MRI

AF ablation vs. **pharmacological rate control**





Non-pharmacological rhythm-control

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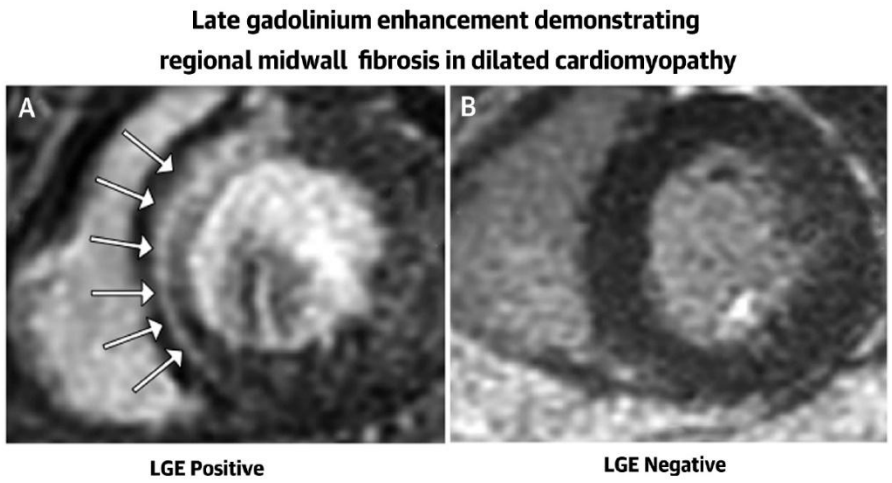
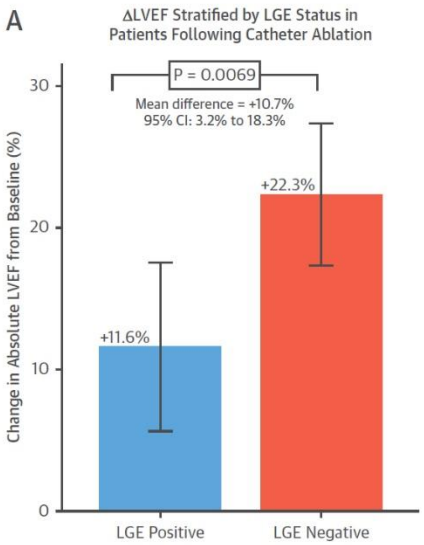
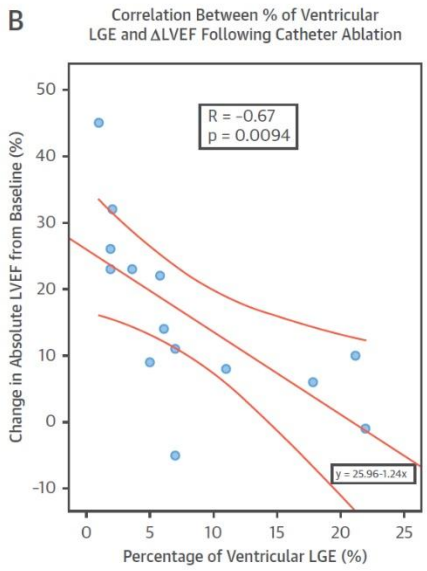
CAMERA-MRI

AF ablation vs. **pharmacological rate control**

↑ LVEF after AF ablation in patients **without LE in LV**







…we can select patients in whom AF ablation will most likely be more beneficial than in others…

Non-pharmacological rate-control ….pace and ablate

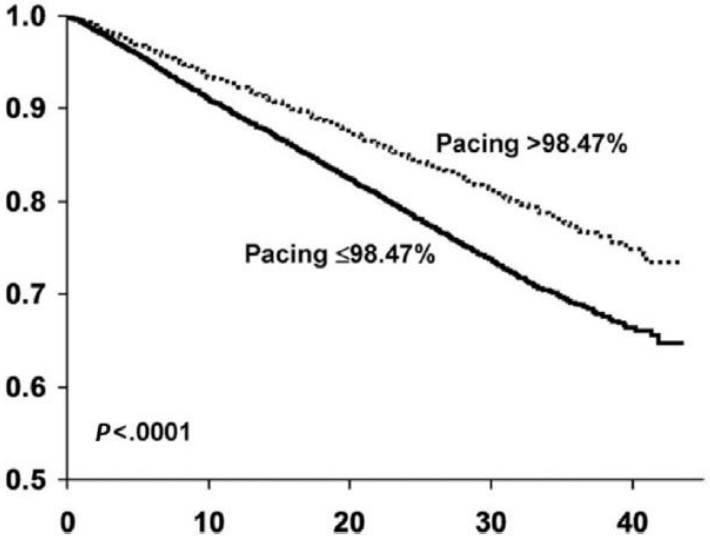
2011/2012 US National Cardiovascular Data

36%	of 87,692	**CRT-D**	- **AF**
31%	of 326,000	**ICD**	- **AF**

NCDR ICD Registry 2011-2 Data

36,000 patients, 2 years FU

pacing **> 98.5%** much better outcomes



To maximize clinical response to CRT, pacing must be delivered nearly universally

Hayes DL, Heart Rhythm 2011

Pace and ablate

Cardiac Resynchronization Therapy in Patients With Permanent Atrial Fibrillation

Results From the Resynchronization for Ambulatory Heart Failure Trial (RAFT)

Jeff S. Healey, MD, MSc; Stefan H. Hohnloser, MD; Derek V. Exner, MD; David H. Birnie, MD; Ratika Parkash, MD, MSc; Stuart J. Connolly, MD; Andrew D. Krahn, MD; Chris S. Simpson, MD; Bernard Thibault, MD; Magdy Basta, MD; Francois Philippon, MD; Paul Dorian, MD; Girish M. Nair, MBBS; Soori Sivakumaran, MD; Elizabeth Yetisir, MSc; George A. Wells, PhD; Anthony S.L. Tang, MD; on behalf of the RAFT Investigators

RAFT study

1798 patients

12.7% (229) permanent AF, with:

HR <60 bpm at rest

HR <90 bpm after 6MHW

randomized to **CRT-D** vs. **ICD**

Primary endpoint: **HF hospitalization or death**

…**no difference** in outcomes between the 2 groups

only 34% had greater than 95% pacing

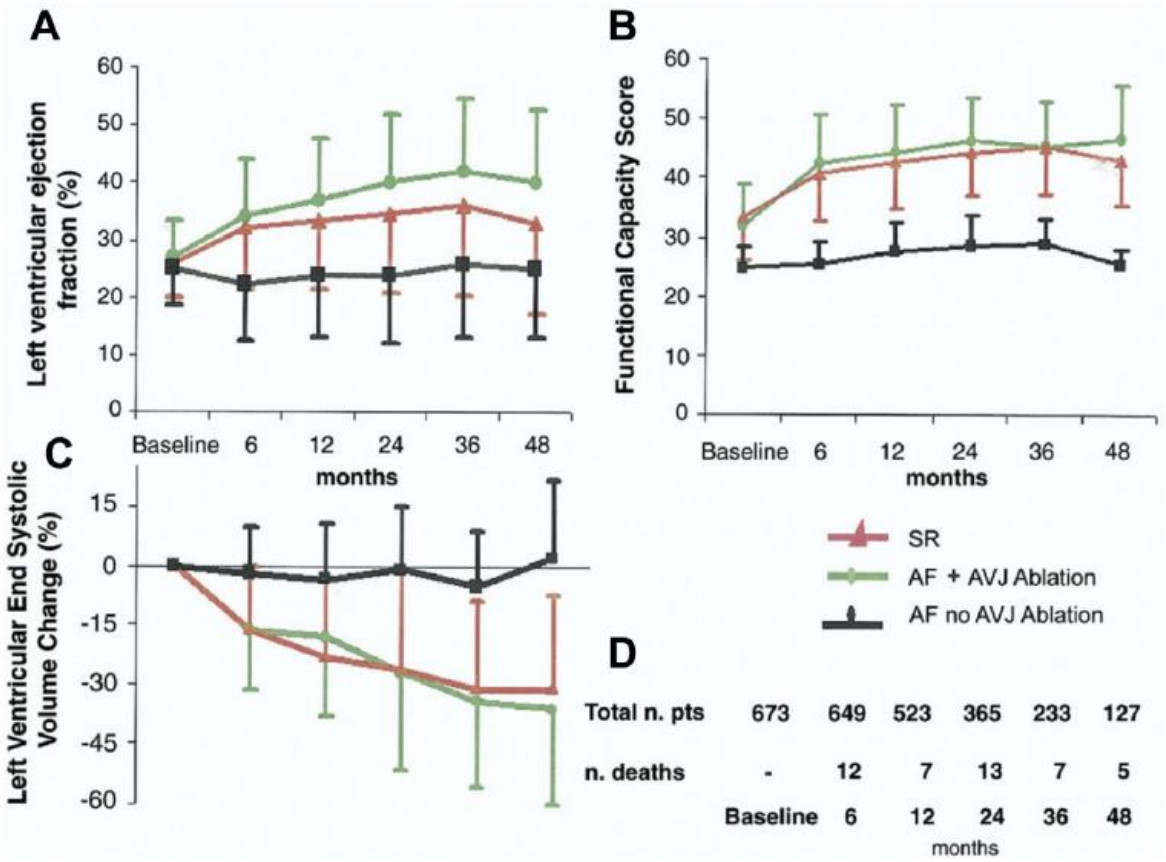
…there are very limited data for the benefit of CRT in permanent AF (without AVN ablation)…

Pace and ablate

114 patients with CRT and AF - 42% achieved “adequate” biventricular capture (>85%)

Only the patients who had undergone **AVN ablation = reverse remodeling**

(↑LVEF, ↓LVESV) and functional improvement



European Heart Journal (2008) 29, 1644–1652
doi:10.1093/eurheartj/ehn133
CLINICAL RESEARCH
Heart failure/cardiomyopathy

Long-term survival in patients undergoing cardiac resynchronization therapy: the importance of performing atrio-ventricular junction ablation in patients with permanent atrial fibrillation

Maurizio Gasparini[1]*, Angelo Auricchio[2,3], Marco Metra[4], François Regoli[1], Cecilia Fantoni[2,3], Barbara Lamp[5], Antonio Curnis[4], Juergen Vogt[5], and Catherine Klersy[6] for the Multicentre Longitudinal Observational Study (MILOS) Group

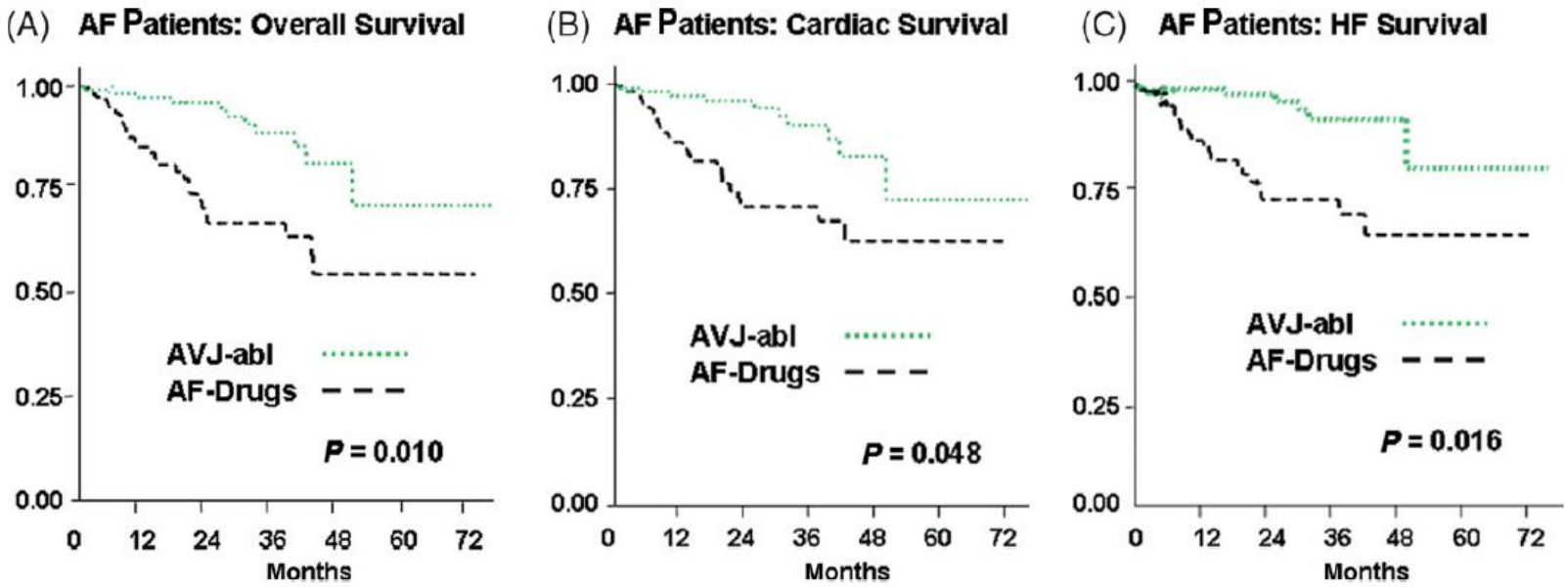
Pace and ablate

Mortality ↓ in AVN ablation, 4% versus 15% in pharm. rate-control.

AVN ablation in CRT ↓ mortality by 40 %

Wilton SB, Heart Rhythm 2011

Ganesan AN. J Am Coll Cardiol 2011



…CRT? – AF? – not suitable for a complex AF ablation? – consider AVN ablation!...

ESC European Society of Cardiology European Heart Journal (2018) 39, 3999–4008 doi:10.1093/eurheartj/ehy555 FASTTRACK CLINICAL RESEARCH Atrial fibrillation

Pace and ablate

A randomized controlled trial of atrioventricular junction ablation and cardiac resynchronization therapy in patients with permanent atrial fibrillation and narrow QRS

Michele Brignole[1]*, Evgeny Pokushalov[2], Francesco Pentimalli[3], Pietro Palmisano[4], Enrico Chieffo[5], Eraldo Occhetta[6], Fabio Quartieri[7], Leonardo Calò[8], Andrea Ungar[9], and Lluis Mont[10]; for the APAF-CRT Investigators†

APAF-CRT

narrow QRS complex

Optimal medical therapy vs. AVN ablation in CRT/permanent AF

hospitalized for **HF** in last 12 months

Any LVEF (42% <35%)

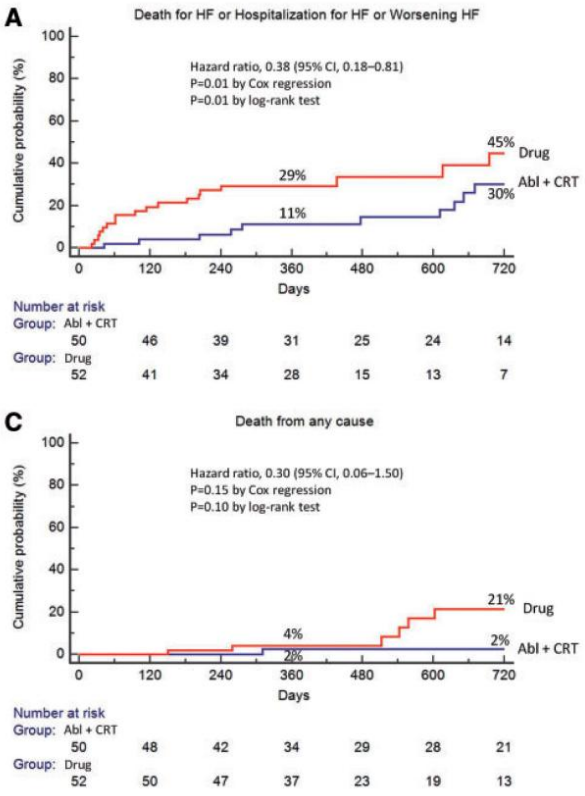
primary endpoint :

all-cause mortality + hospitalization for HF

AVNA + CRT = superior to medical therapy

Absolute risk reduction of 18%

NNT= 5.5



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FASTTRACK CLINICAL RESEARCH
Atrial fibrillation

A randomized controlled trial of atrioventricular junction ablation and cardiac resynchronization therapy in patients with permanent atrial fibrillation and narrow QRS

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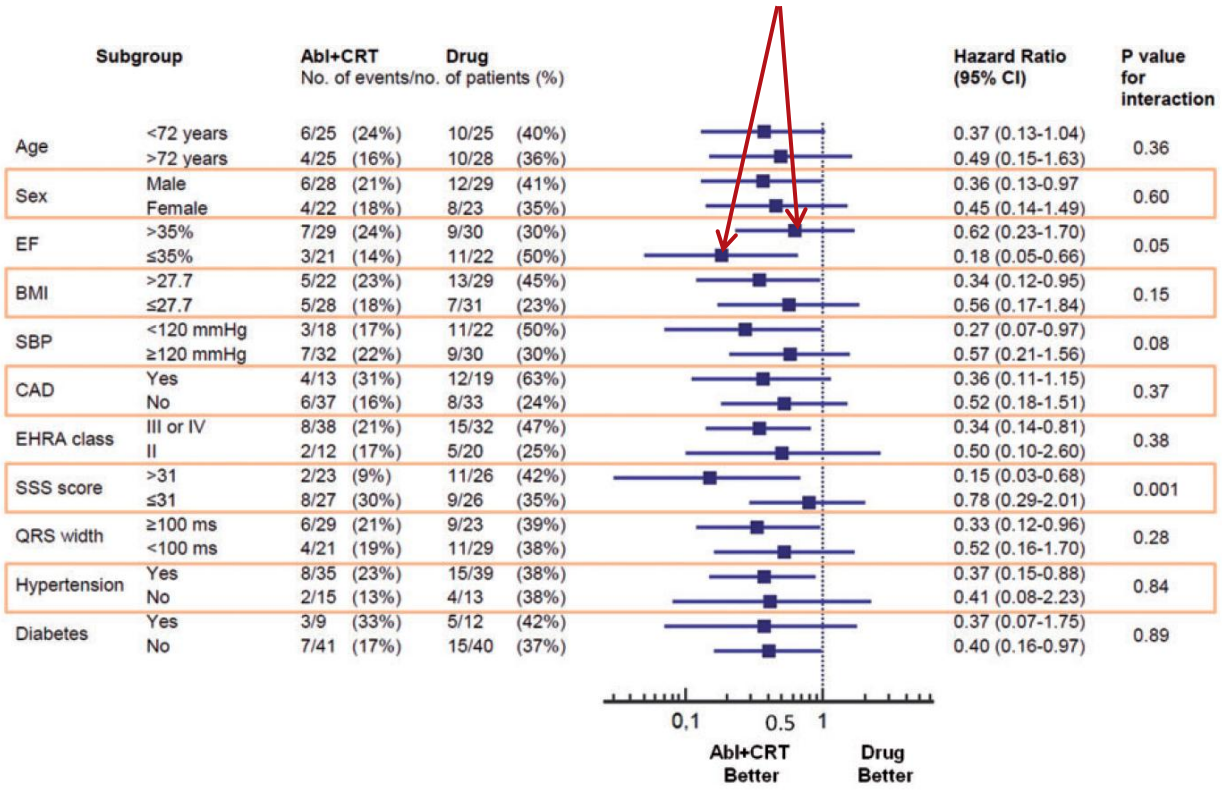
APAF-CRT

Optimal medical therapy vs. **AVN ablation** in CRT/permanent AF

***narrow QRS* complex**

hospitalized for **HF** in last 12 months

*Reduction in **harder endpoints** is expected to be more marked in those with **reduced EF***



AF catheter ablation
OR
CRT + AV node ablation?

PABA-CHF

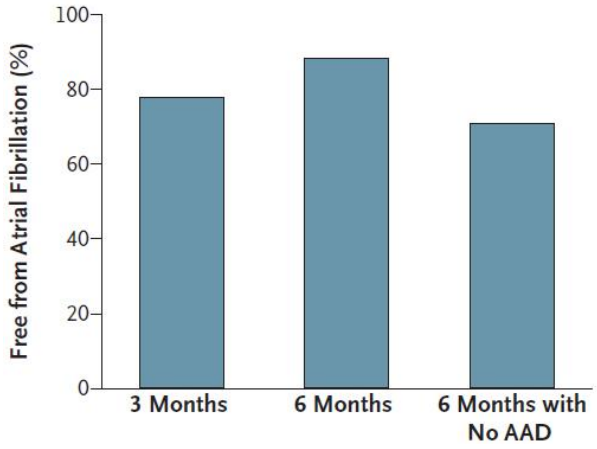
AF ablation (PVI) vs. **CRT+AVN ablation**

AF, EF<40%, NYHA II-III

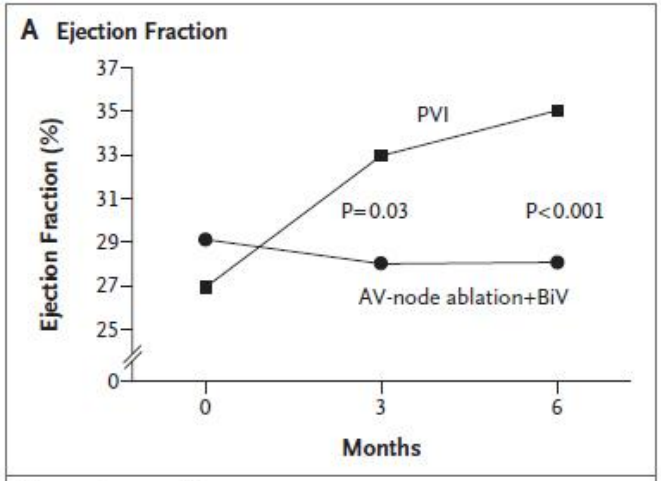
FU 6 months, SR:

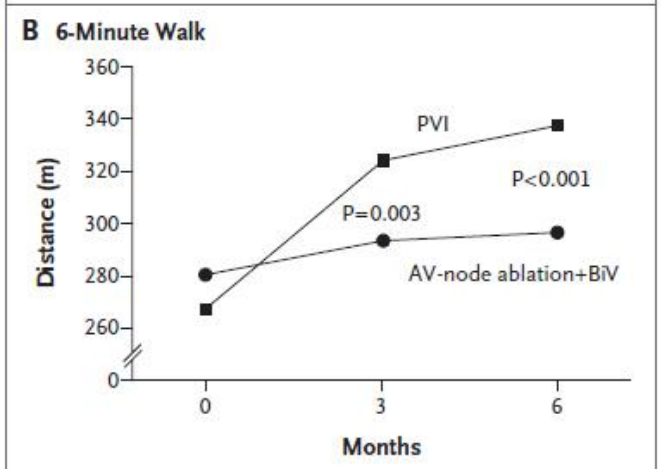
88% with AA

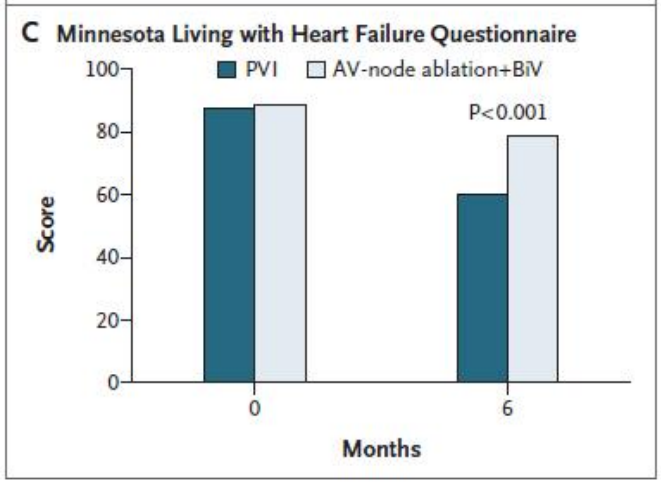
71% without AA



In a direct comparison, AF ablation is better than CRT+AVN ablation







Clinical guidance to the choice of treatment in patients with AF and HFrEF

Factors favouring AF ablation	Factors favouring medical therapy or pace-and-ablate strategy
Recent onset HF	History of HF >> AF
Recent onset AF with fast ventricular rates	Long-standing persistent AF with controlled ventricular rates
Idiopathic CMP	Ischaemic or valvular CMP
Ventricular LGE-MRI negative	Ventricular LGE-MRI positive
LVEF ≥25%	LVEF<25%
LA diameter <55 mm	LA diameter ≥55 mm
LA fibrosis (LGE-MRI) ≤10%	LA fibrosis (LGE-MRI) >10%
Young patients (<65 years)	Elderly patients (≥80 years)
No/few comorbidities	Major comorbidities
Experienced high-volume centre	Less experienced low-volume centre
	Failed repeat ablation of persistent AF
Low peri-procedural risk/high benefit	***High peri-procedural risk/low benefit***

Tachycardia-induced CMP?

- Should always be considered in patients with **new-onset or worsening HF** in the setting of AF with **rapid ventricular response**, particularly in those without prior history of ischemic or structural heart disease
- Not only rapid but also normal irregular ventricular responses can lead to TCM (alike VPBs), *pharmacological rate control alone may not be sufficient*

Cardioversion….6-8 weeks (SR)…reevaluate TTE

- The **greatest clinical benefit from restored sinus rhythm**
- We can avoid unnecessary long-term medical or device-based treatment for HF, improve prognosis

Ventricular premature beats ablation

RFA of PVCs ↑ LVEF in patients with LV systolic dysfunction

Takemoto M. J Am Coll Cardiol 2005

Benefit of PVC suppression originally described in suspected PVC-induced CMP (elimination of the primary cause)

Chugh SS, J Cardiovasc Electrophysiol 2000

Recent studies - PVC ablation ↑LV systolic function in other clinical scenarios (post-MI, CRT-non-responders, non-ischemic CMP)

Sarrazin JF. Heart Rhythm 2009

Lakkireddy D, J Am Coll Cardiol 2012

Lowest PVC burden associated with LV dysfunction = 4%

Shanmugam N, Eur J Heart Fail 2006

Ventricular premature beats ablation

Mean improvement of 12% in LVEF after PVC ablation in patients with frequent PVC and LV dysfunction

Mountantonakis. Heart Rhythm 2011

….superior to that achieved by other heart failure treatments, as for example ACEi or CRT

Solomon SD, Circulation 2005

St John Sutton MG, Circulation 2003

… comparable to that obtained with beta-blocker therapy

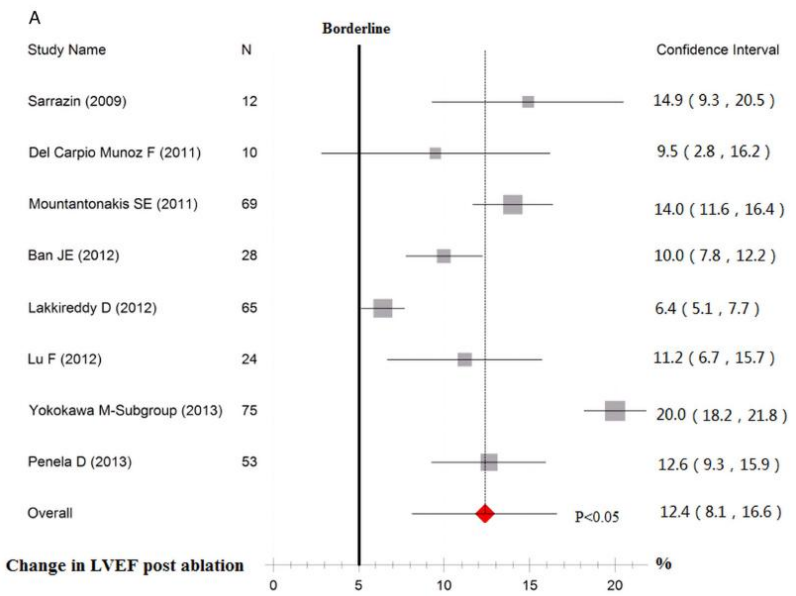
De Groote P, Am Heart J 2007

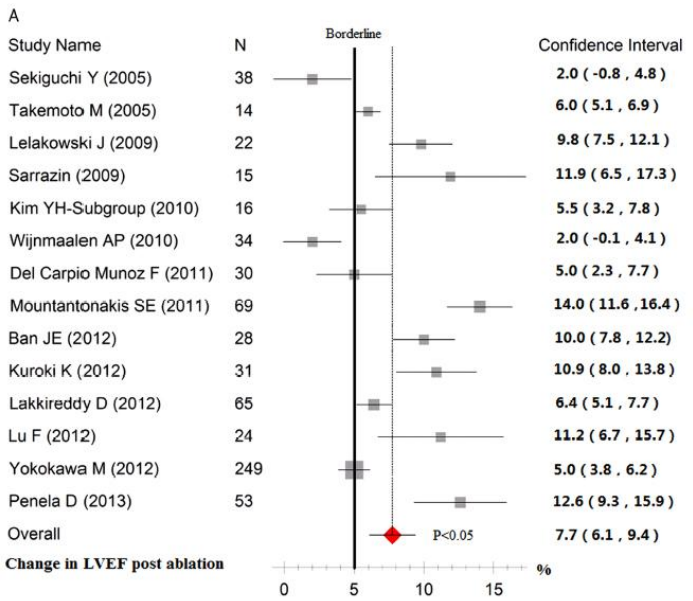
increases the efficacy of CRT

Lakkireddy D, J Am Coll Cardiol 2012

allows for withdrawal of the indication for primary prevention ICD

Penela D, Heart Rhythm 2015

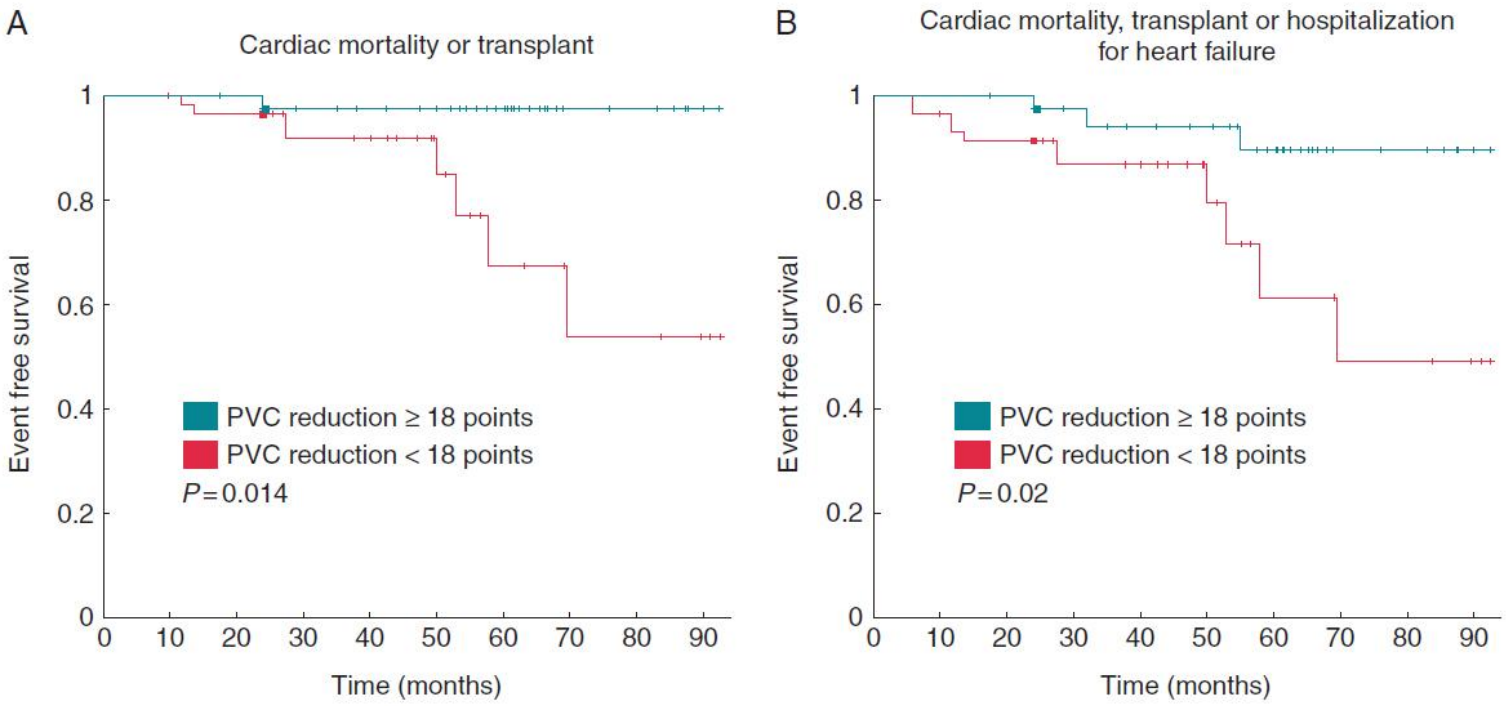




Ventricular premature beats ablation

Good outcome after PVC ablation not only in tachycardia-induced CMP

but also **in an unselected population of patients with LV systolic dysfunction**



Conclusion

- Catheter ablation can safely be performed with acceptable complication rates in patients with HFrEF

- Compared with standard drug therapy, catheter ablation of AF in patients with HFrEF reduces all-cause mortality and HF hospitalization and improves LVEF, functional capacity, and quality of life

- Little evidence is available to support that CRT is effective in patients with permanent AF without AVN ablation – maximize CRT! – not suitable for complex ablation? – AVN ablation

- PVC ablation indication should be done rather according to PVC burden and not the supposed etiology

Thank you
for your attention