LONG-TERM RESULTS OF AF ABLATION IN PARTICULAR SETTINGS

Dr. Marco Scaglione

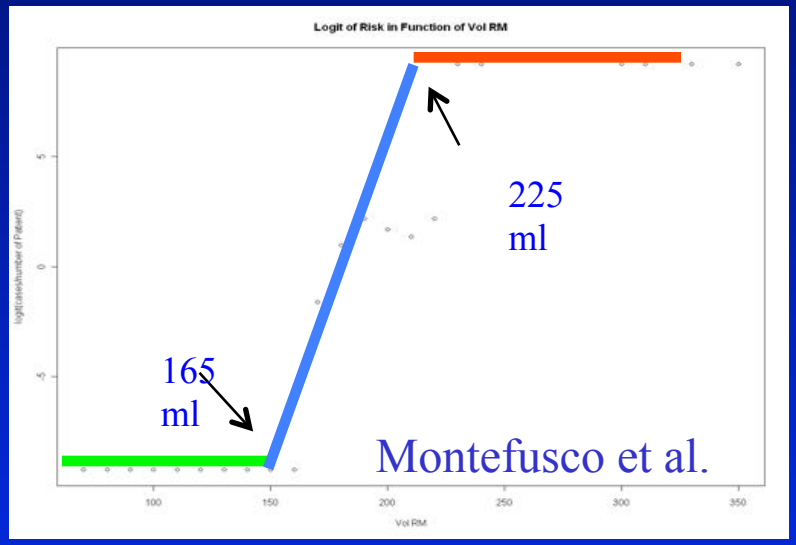
Division of Cardiology - Asti

University of Turin - Italy

Patients included into AFib Ablation trials

… the others…

1- Dilatation of left atrium



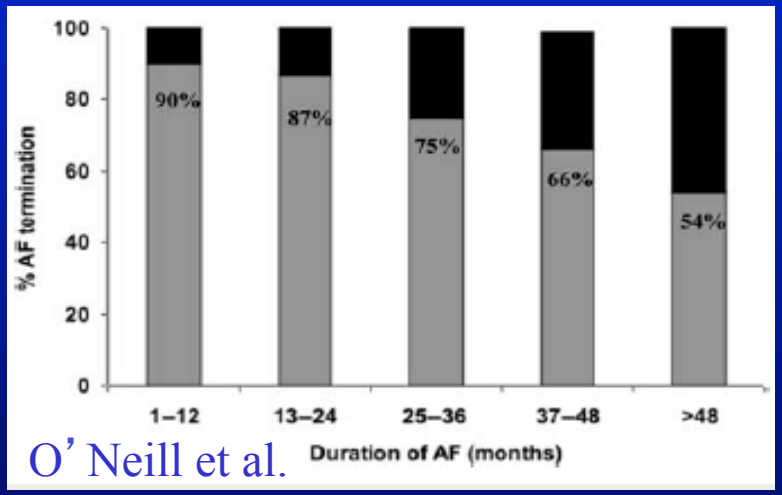
Beukema WP. Circulation 2005; 112:2089

Berruezo A. Eur Heart J 2007; 28:836

Montefusco A, JCM 2010

Di Donna P. Europace 2010; 12:347

2-Duration of atrial fibrillation



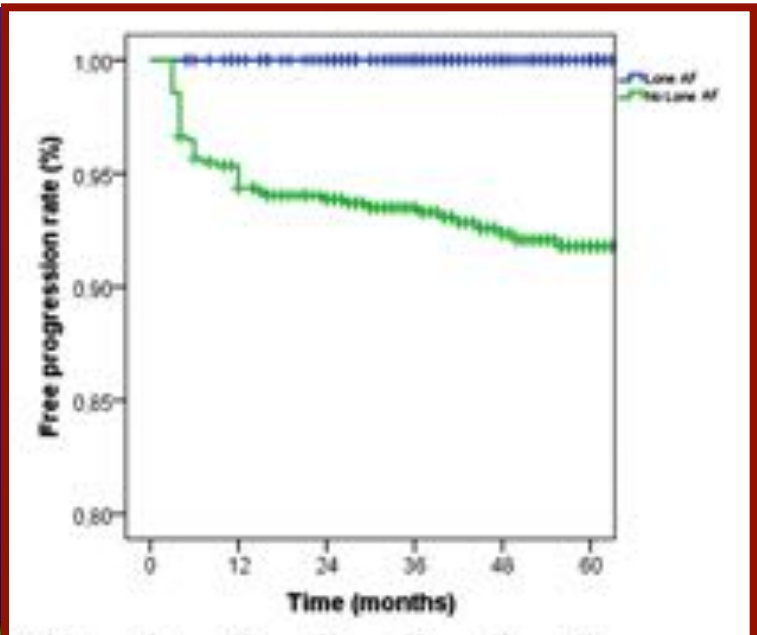
Della Bella Europace 2005; 7: 95

O' Neill M. E HJ 2009; 30:1105

Balk E. JCE 2010, Vol pp. 1-9

Rostock T. et al. Heart R. 2011

889 patients underwent AFTCA
mean age 57± 11years;
53.3% parox AF, 40.5% persist AF, 6.2% long-standing AF).
F-up of 64 months (range 41–84 years)
AF progression despite AFTCA occurred in 57 cases (6.4%).
Independent predictors of progression: comorbidities/ cardiomyopathies and baseline persistent/long-standing AF (odds ratio 11.3, 95% confidence interval 2.6–48.0, P o.001, and odds ratio 1.6, 95% confidence interval 1.2–2.1, P o.001, respectively).



Scaglione et al. Heart Rhythm 2014

Very long-term outcome after initially successful catheter ablation of atrial fibrillation

Jonathan S. Steinberg, MD, FHRS, Rachel Palekar, BA, Tina Sichrovsky, MD, Aysha Arshad, MD, Mark Preminger, MD, Dan Musat, MD, Richard E. Shaw, PhD, Suneet Mittal, MD, FHRS

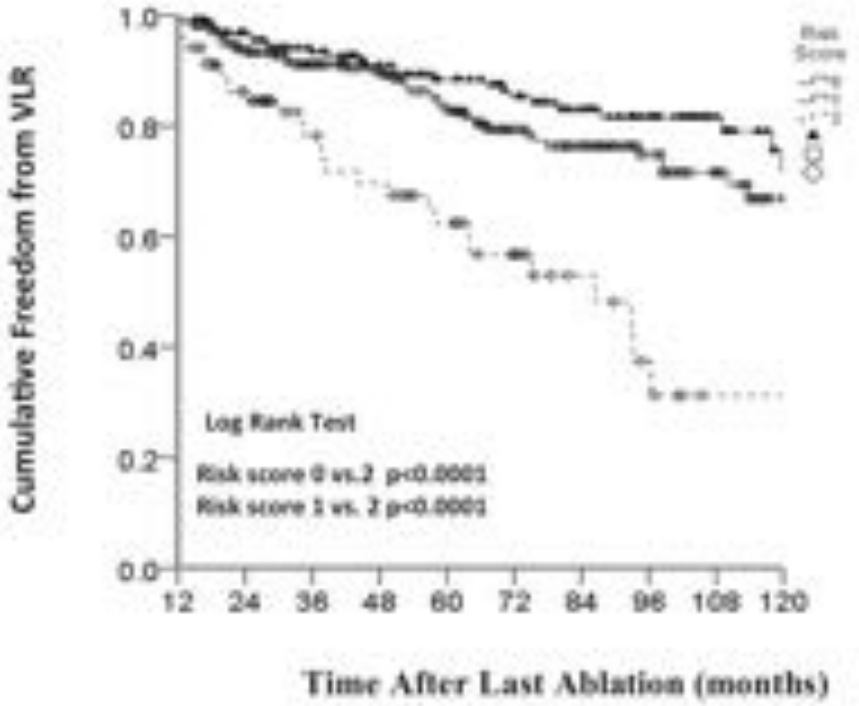
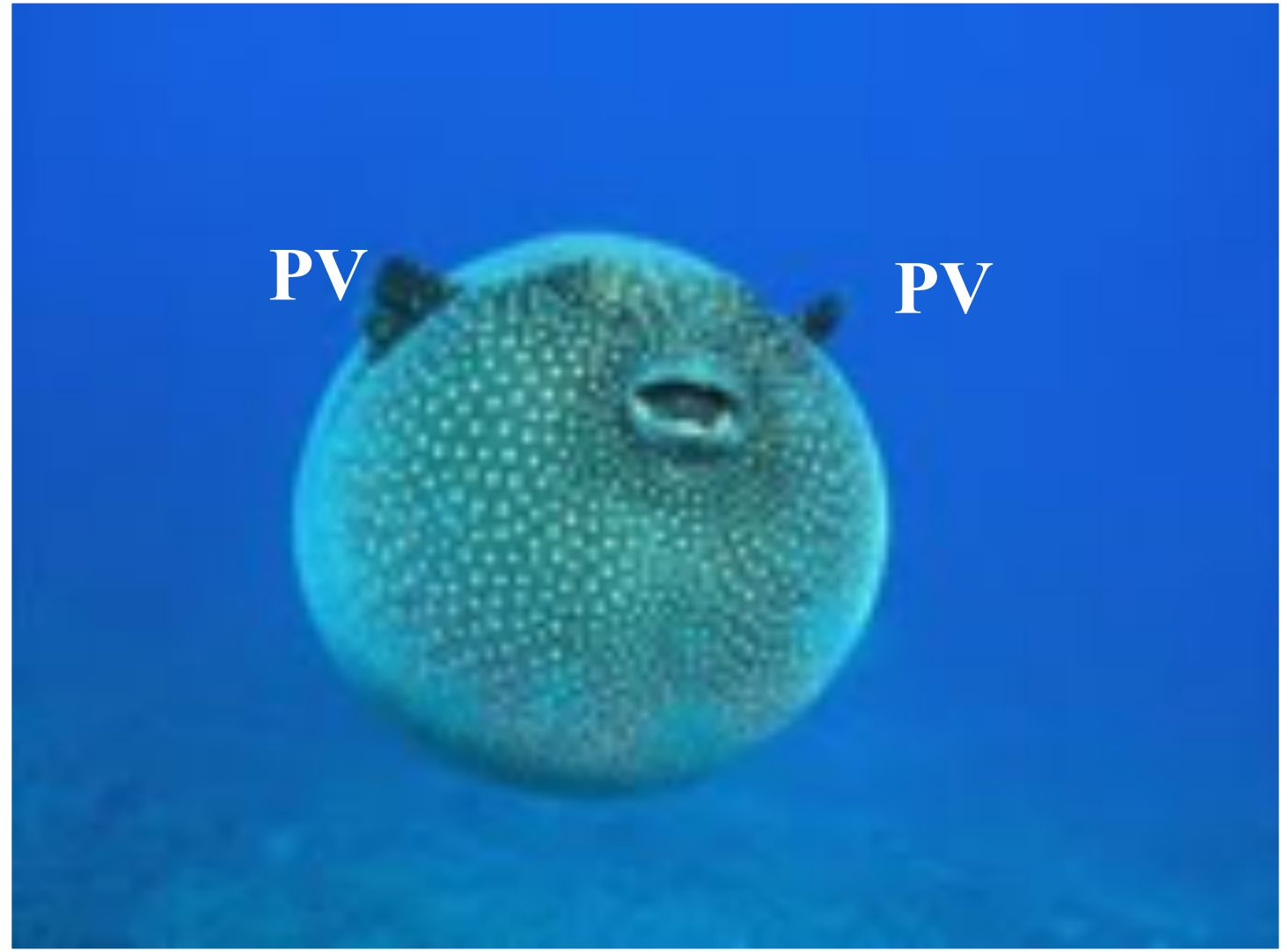


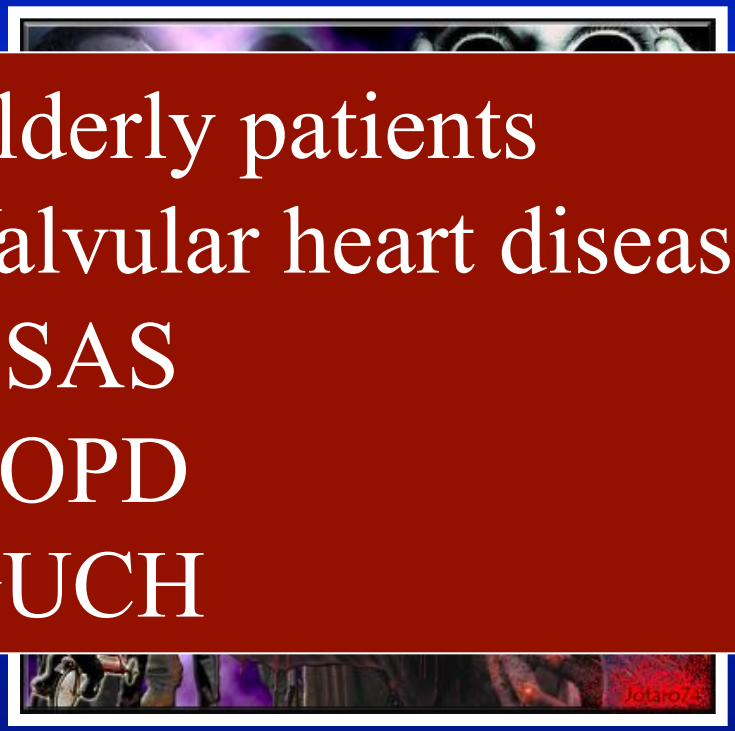
Figure 3 Kaplan-Meier plot for freedom from atrial fibrillation based on the presence of 0–2 independent risk factors (history of persistent atrial fibrillation and hypertension). VLR = very late recurrence.

Persistent AF
Hypertension

Heart Rhythm 2014

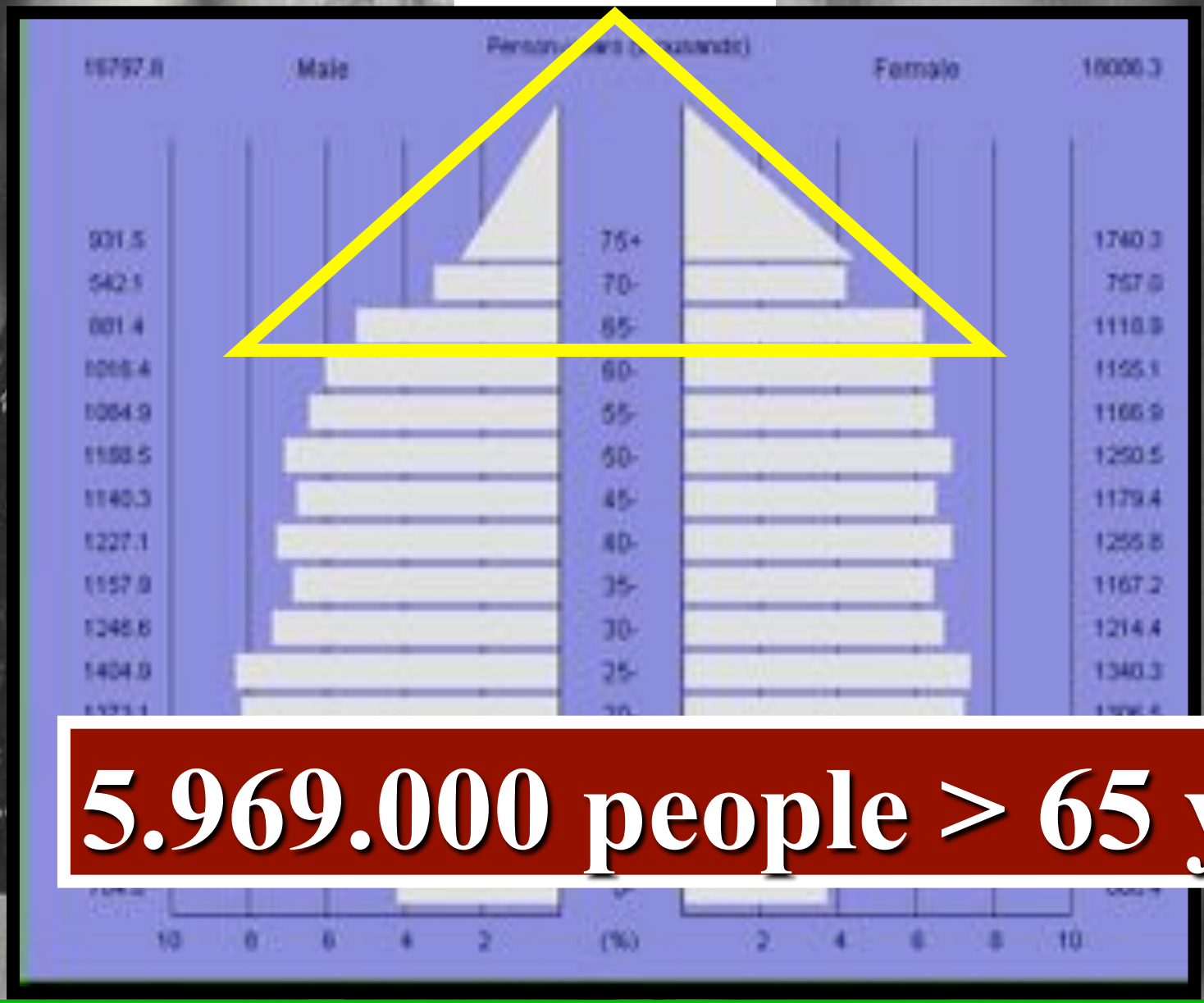

PV
PV

…the others…
Who are they?



Elderly patients
Valvular heart disease
OSAS
COPD
GUCH

Italy



5.969.000 people > 65 y

AGE and AF TROUBLES

Co-morbidity

Higher TE and bleeding risk

Persistent > Paroxysmal

Etiopatogenesis

Drugs: side effects

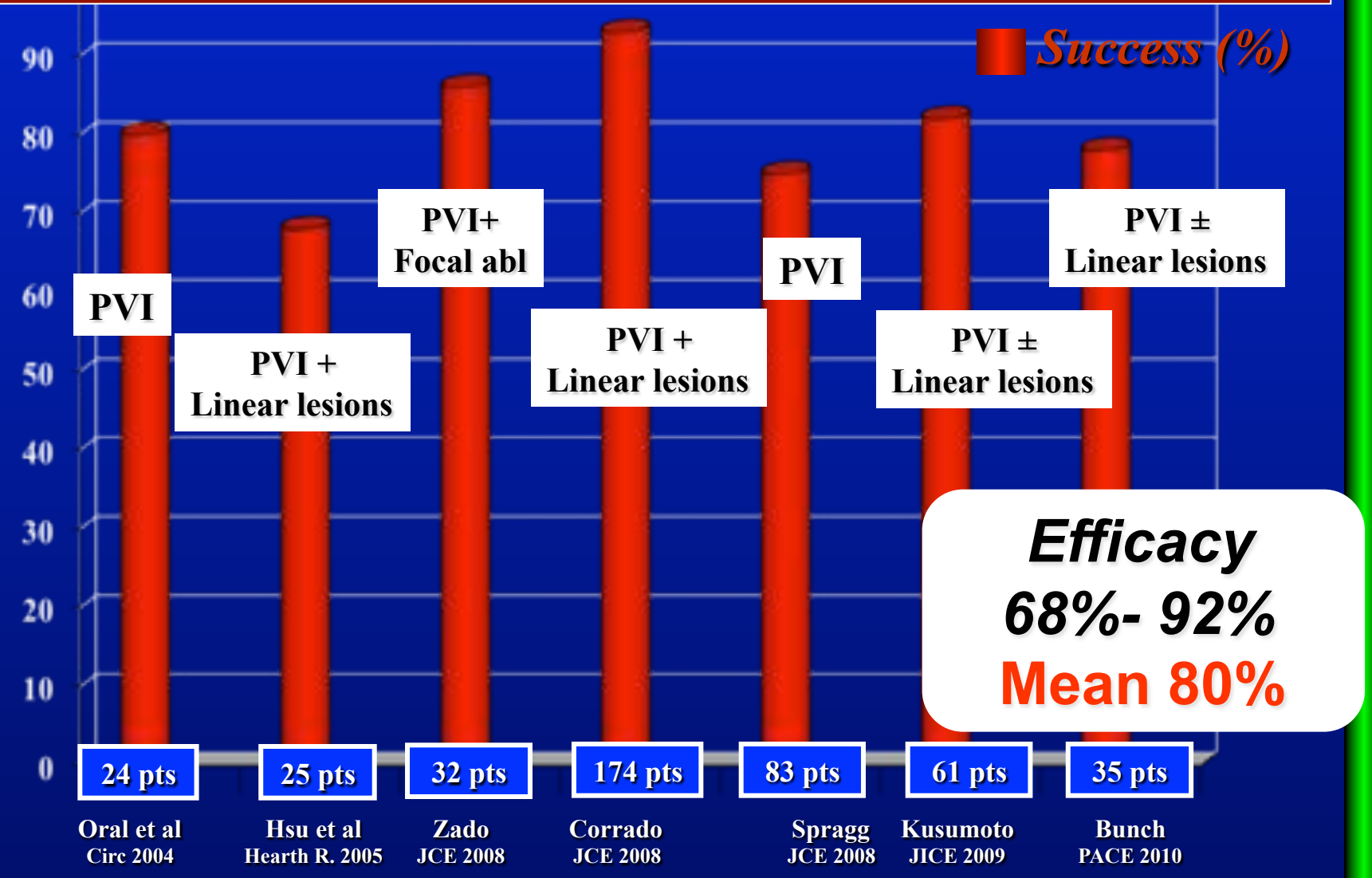
Clinical characteristics in elderly patients

Study	N. Of pts	Age (Years)	Male	AF type	LA size (mm)	SHD	Comparisons
Bhargava et al. (2004)	103	>60 (66.6 ± 4.18)	77%	PAF (52%) Pers. (8%) Perm. (40%)	43.4 ± 0.6	63%	Age <50, ≤60
Oral et al. (2004)	24	>70 (73 ± 2)	54%*	All PAF (88%)	42±7	N/A	Age <70
Hsieh at al. (2005)	37	≥65 (72 ± 4)	92%	PAF	37 ± 5	62%	AVJ ABL + pacing
Hsu et al. (2005)	22	≥65	59%*	Perm.	49 ± 3	36%	Age <45, ≤45, <65
Zado et al. (2008)	34	≥75 (77 ± 2)	44%*	All PAF (53%)	44 ± 10	88%*	Age <65, ≤65, <75
Corrado et al. (2008)	174	≥ 75	63%	All PAF (55%)	46 ± 6	68%	None
Spragg et al. (2008)	83	≥70	N/A	PAF pers.	N/A	N/A	Age <70
Bunch et al. (2010)	35 (717)	≥80	45%	PAF (46%) / pers	24 ± 9	31%	Age <80

*p <0.05

AF Ablation in the Elderly: Results from 7 retrospective studies

434 pts > 70 years / 3935 total population (11%)



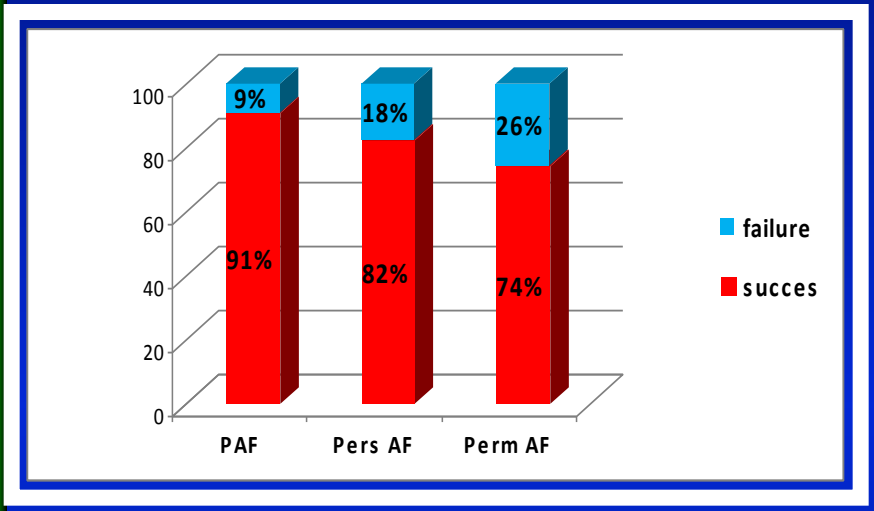
Efficacy

68%- 92%

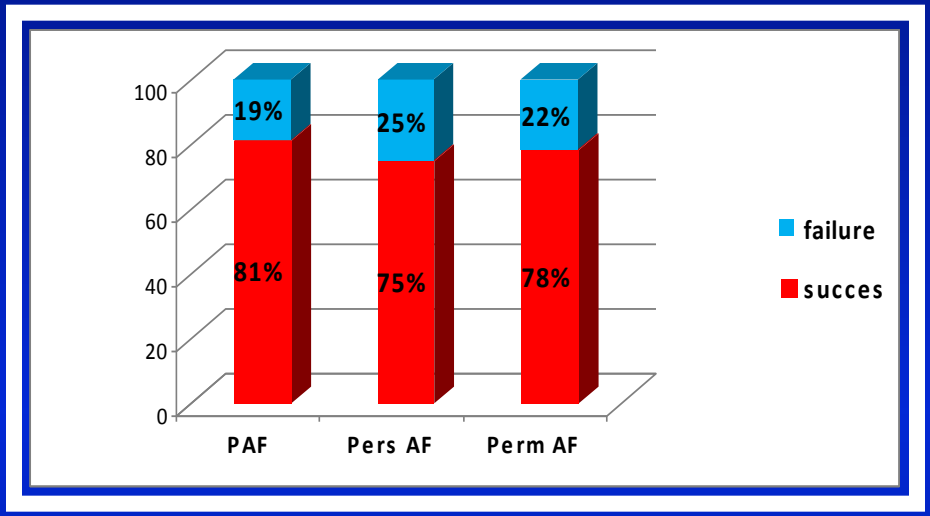
Mean 80%

Impact of Age on the Outcome
PVI for AF Ablation

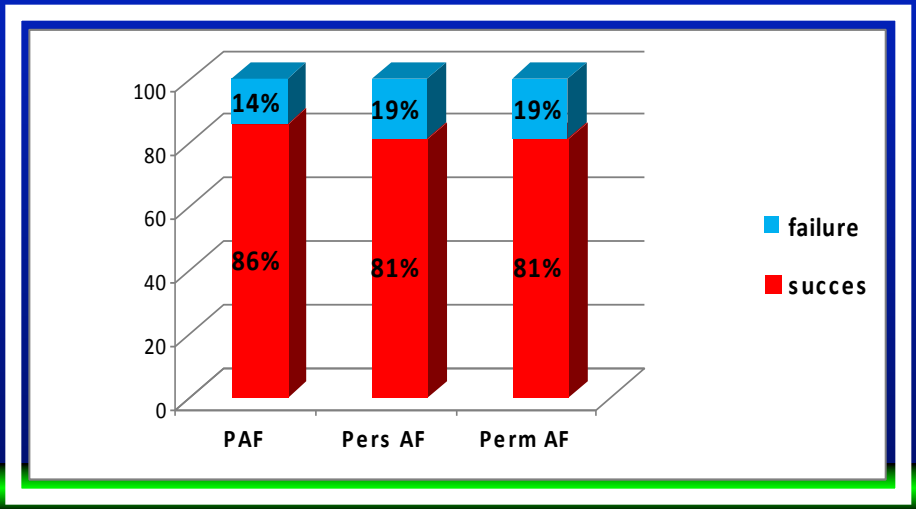
<50 y



>60 y

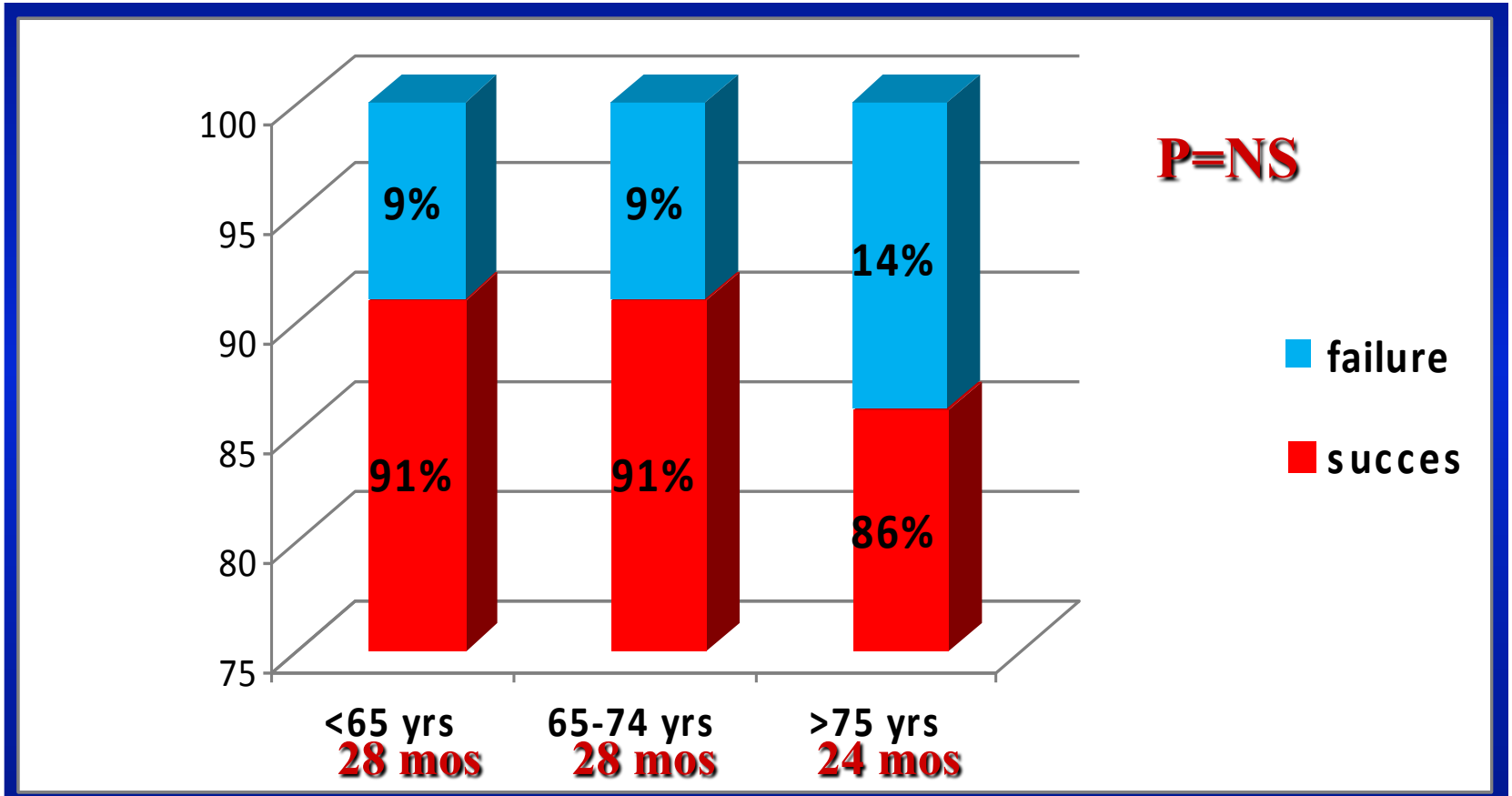


50-60 y



Bhargava et al. JCE 2004

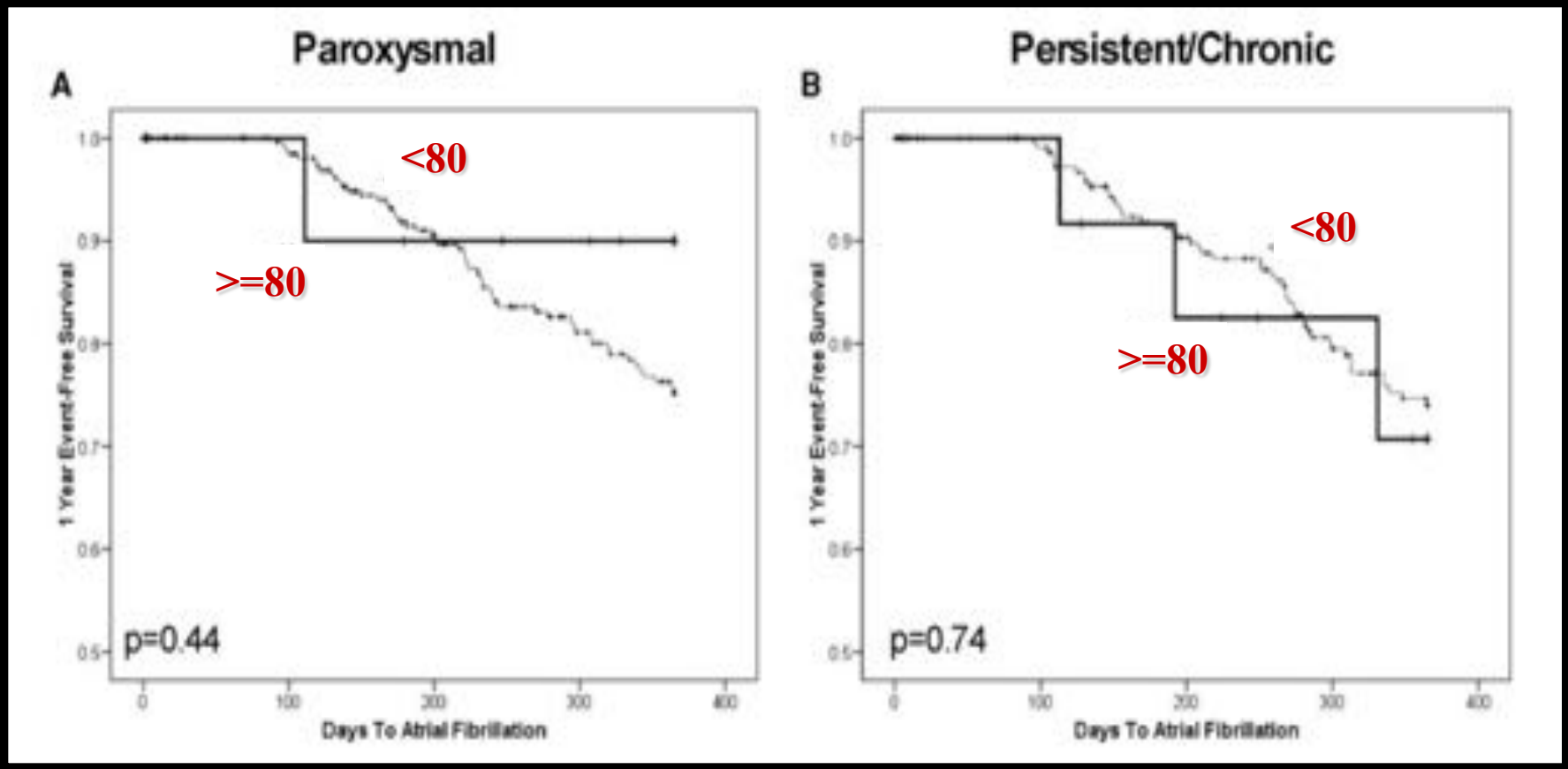
Impact of Age on the Outcome
PVI for AF Ablation



Zado E. et al. JCE 2008

Outcome of AF ablation during 1 Y follow up

PVI-lines



Bunch et al. PACE 2010

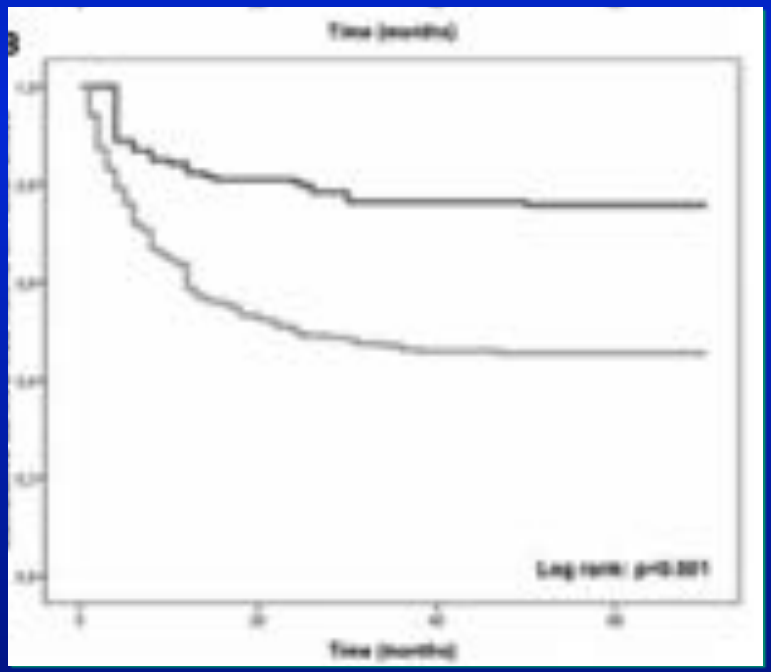
AF Ablation in the Elderly: our center experience

412 subjects, mean age 76 yrs, male 72%, Persistent AF 100%, prospective non randomized study

AF Ablation, n 153 pts

No differences between groups

AAD n 259 pts

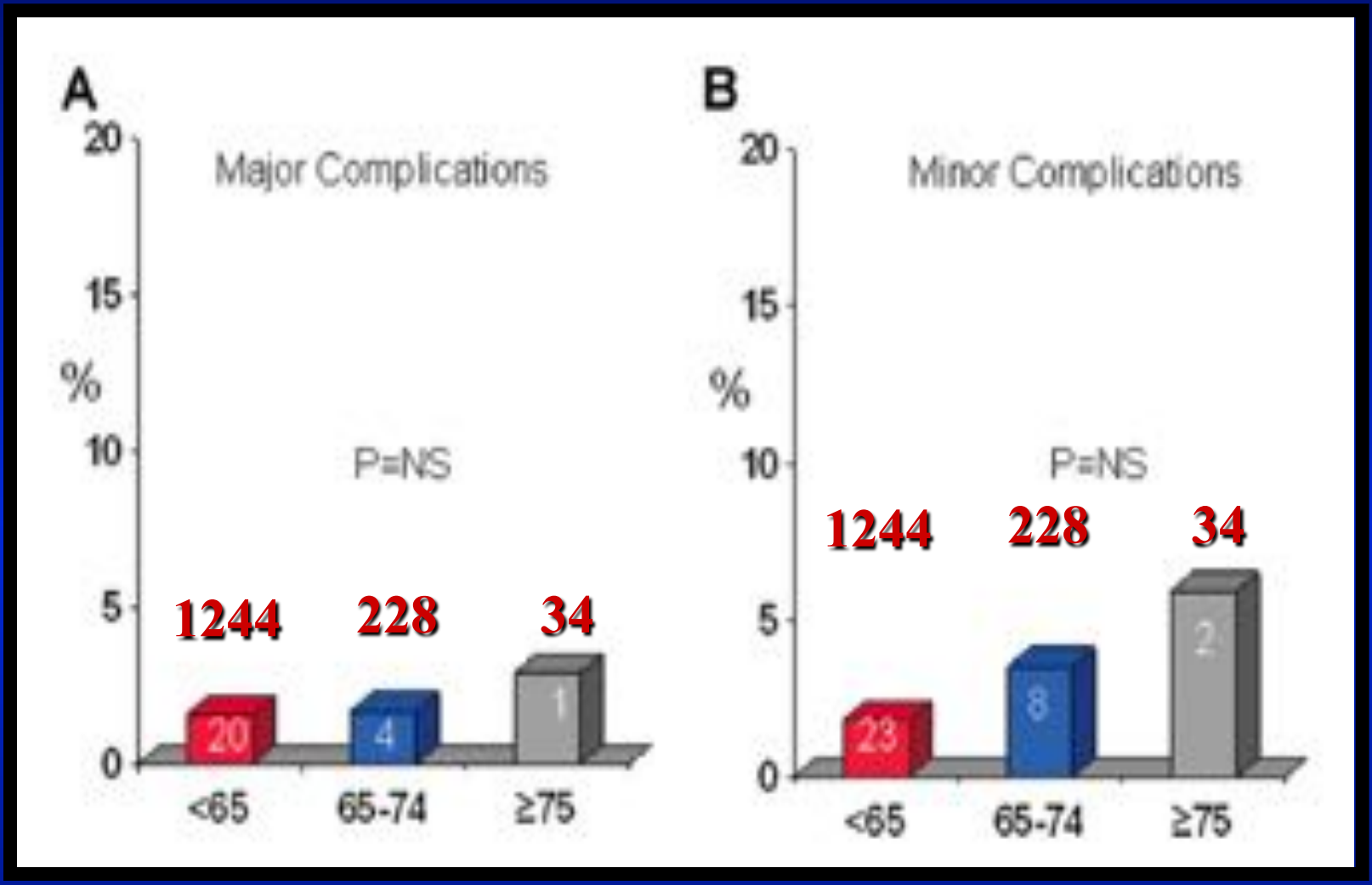


Follow up 60 ± 17 months

76 % vs 46 % (p value < 0.001)

In elderly persistent AF patients, catheter ablation is more effective in maintaining SR and in improving QoL than AAD

Blandino A, Scaglione M, Gaita F et al JCE Vol. 24, pp. 731-738, July 2013



Zado E. et al. JCE 2008

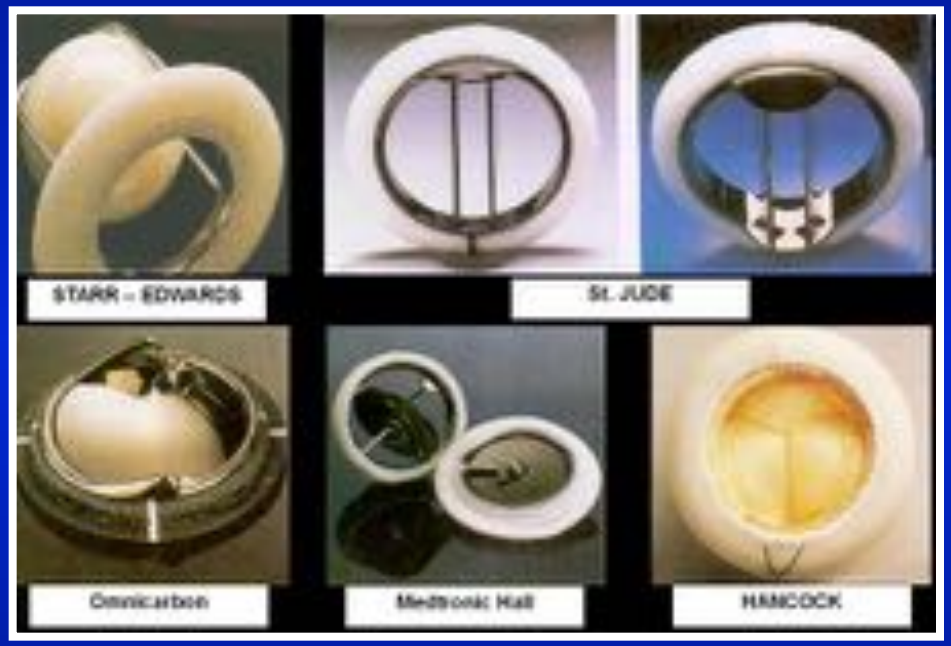
1) CONCLUSIONS:

AF ablation in elderly is feasible

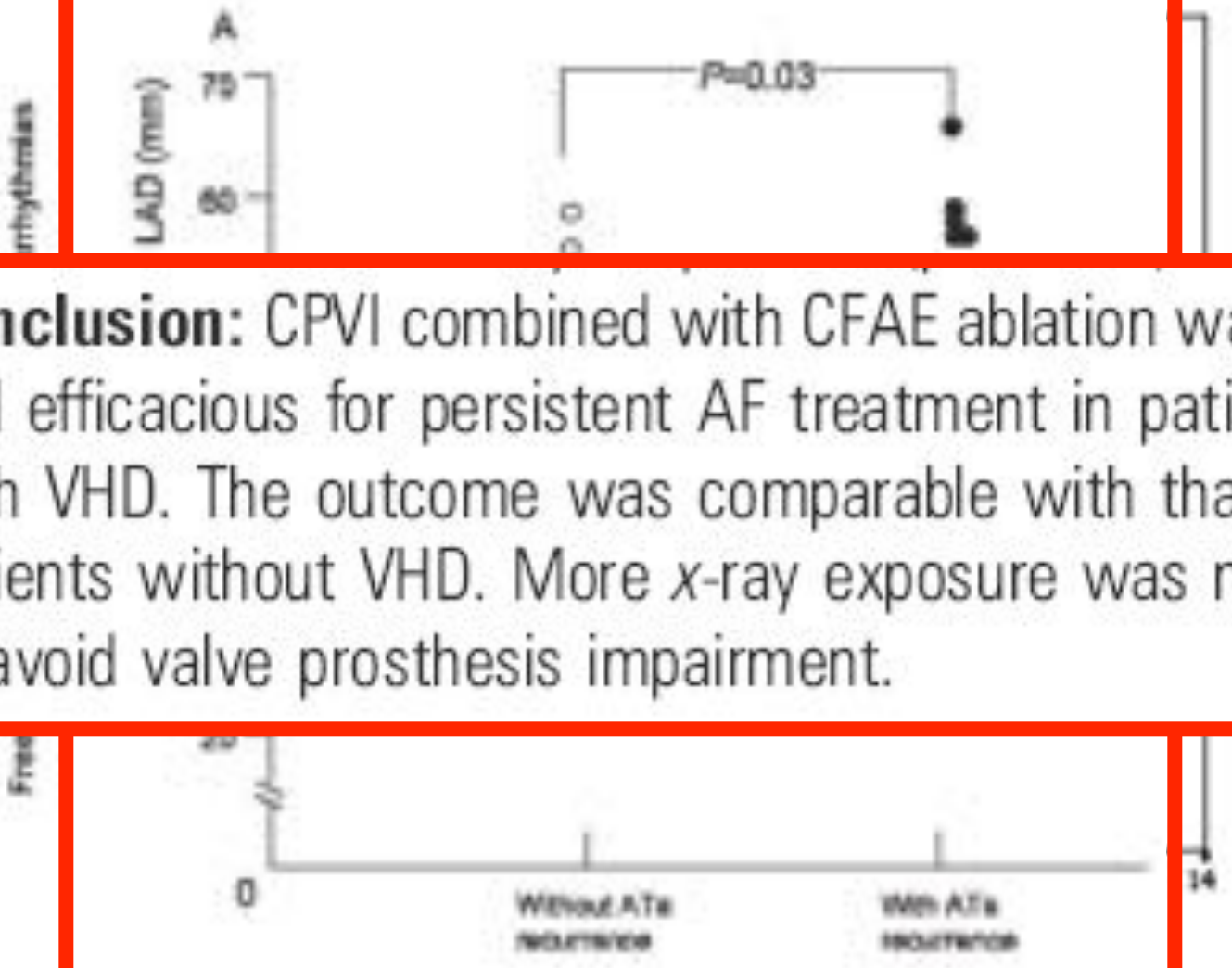
…success rate is good and comparable with younger pts

…complications rate is similar (vascular access*)

VALVULAR HEART DISEASE AND PROSTHESES



Few articles



Conclusion: CPVI combined with CFAE ablation was safe and efficacious for persistent AF treatment in patients with VHD. The outcome was comparable with that in patients without VHD. More *x*-ray exposure was needed to avoid valve prosthesis impairment.

Wang X et al. Heart 2009

1547-5271/$ -see front matter © 2004 Heart Rhythm Society. All rights reserved.
doi:10.1016/j.hrthm.2004.02.007

Patient demographics and clinical characteris
shown in Table 1. Of 391 patients, 197 (50%) pati
structural heart disease, including 94 (24%) patie
LV dysfunction, defined as ejection fraction belo
102 (26%) with known clinically significant valv

	Lone AF	disease	CV
Fluoroscopy time (min)	83 ± 26	85 ± 20	8
Procedure time (h)	4 ± 1	4 ± 1	
Mean number of RF lesions/PV (min)	9.4 ± 3.4	9.7 ± 2.6	9.

p = not significant.
AF = atrial fibrillation; PV = pulmonary vein; RF = radiofr

Table 2 Pulmonary vein isolation and follow-up res

	Lone AF	Valve disease	CV
Fluoroscopy time (min)	83 ± 26	85 ± 20	8
Procedure time (h)	4 ± 1	4 ± 1	
Mean number of RF lesions/PV (min)	9.4 ± 3.4	9.7 ± 2.6	9.

p = not significant.
AF = atrial fibrillation; PV = pulmonary vein; RF = radiofr

Khajkin et al Heart Rhythm 2004

From the *Cleveland Clinic Foundation, Section of Pacing and Electrophysiology, Cleveland, Ohio; and †Sutter Pacific Heart Centers, San Francisco, California.

Manuscript received August 23, 2004; revised manuscript received October 20, 2004, accepted November 15, 2004.

procedure, leaving 63 patients in
1, age 57 ± 13 years, 12 female).
patients, 189 were excluded becau

with without

other (6–9). Also, a considerable number of patients have AF recurrence after ablation of typical AFL (16). The reasons for co-existence are not entirely clear, but it is possible that PV triggers may initiate AFL as well as AF, or may convert AFL to AF (7,10,11). We have reported, for example, that in patients with both typical AFL and AF, PVAI alone was sufficient to control both arrhythmias (10). The results presented in this series are consistent with our previous report. Indeed, 94% (219 of 234) of patients who had pre-existing AFL were cured by PVAI alone in the control group (Group 2). In contrast, only 15 of 24 PCS patients (63%) with pre-PVAI AFL were free of AFL after PVAI. Furthermore, 21 (33%) PCS patients experienced AFL occurrence after PVAI. These results demonstrate that the elimination of PV triggers may not prevent the occurrence of AFL in a significant number of patients with PCS.

from areas other th
AFL if the appropr
(21,22). Indeed, it
mature atrial beats
AFL (9,23,24). Bec
arrhythmogenic sub
currence as a result

Early recurrence
PVAI for the firs
transient finding ar
(10,12). In the studi
AFL recurrence (v
PVAI procedure) v
term AFL recurren
present study, 18%
previous PCS and

Kilicaslan et al JACC 2005

From the Division of Cardiac Pacing and Arrhythmias, San Raffaele Hospital, Milan, Italy. Drs. Lang and Mesas were Research Fellows at the Hospital University in Milan at the time of data collection.

Manuscript received July 2, 2004; revised manuscript received October 8, 2004, accepted November 22, 2004.

esophageal ecl
chronic AF
thrombus. Th
tained betwee

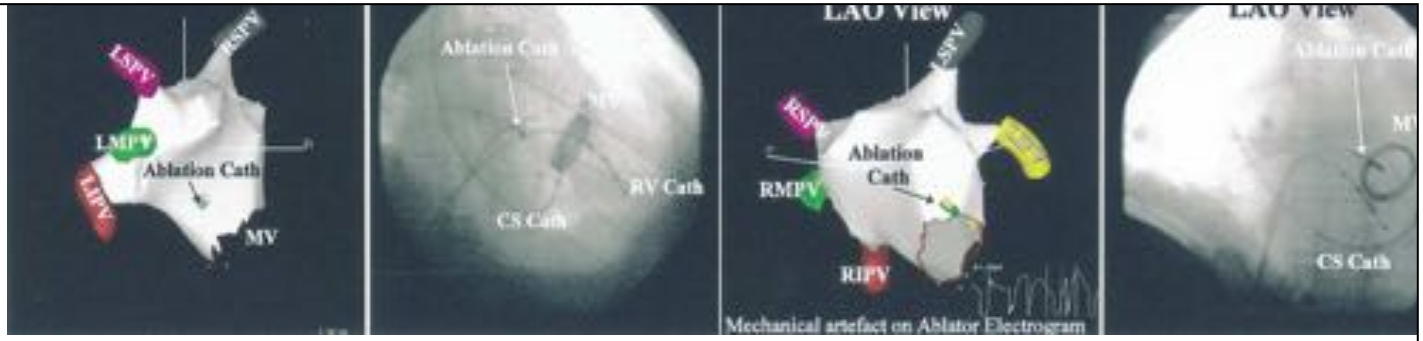


Figure 2. Simultaneous images of catheter positions as seen on fluoroscopy and CARTO. The fluoroscopy helps establish the precise location of the m valve ring in relation to the CARTO map. CARTO has the advantage of being able to see the catheter tip position in multiple views simultaneo However, with fluoroscopy, the valve leaflets are clearly visible, and contact between the catheter and the leaflets can be readily identified. The **electrog inset in the panels in the third column** shows the typical appearance of a mitral annular electrogram recorded from the ablation catheter, whereas the **i just below it** shows the characteristic artifact seen when the catheter is in contact with the mechanical leaflets.

MVP: 1 TIA and 1 pseudoaneurism

Lang et al JACC 2005

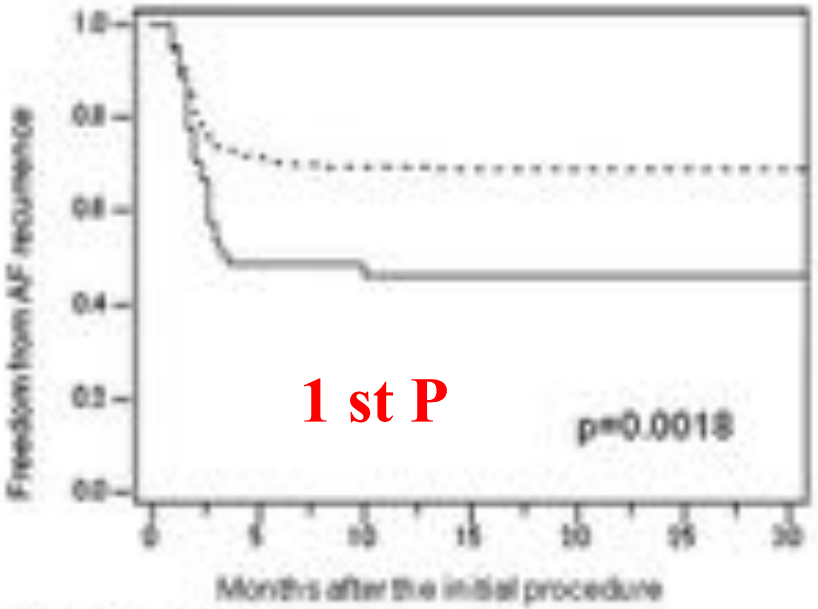
1547-5271/$ -see front matter © 2011 Published by Elsevier Inc. on behalf of Heart Rhythm Society. doi:10.1016/j.hrtl

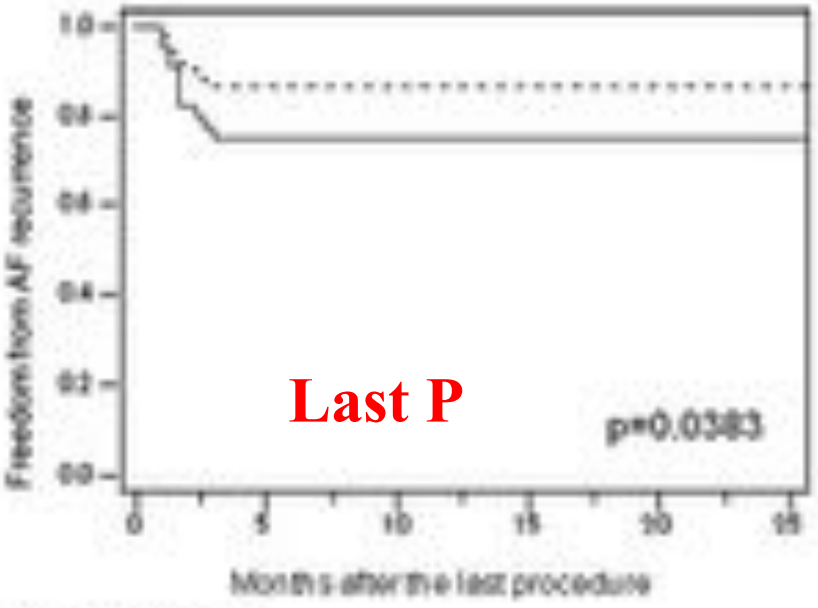
or segmental ablation at SVC–right atrial junction in 4
patients). Total procedural time (199.4 ± 49 minut
166.6 ± 27.5 minutes, $P < .001$), mean RF time (48
minutes vs 36 ± 8 minutes, $P < .01$), and fluoroscopy
(60 ± 17 minutes vs 53.8 ± 6.8 minutes, $P < .01$)
prolonged in the valve group compared to controls (
2). At 3-month follow-up, no significant difference wa
between groups I and II with regard to recurrence ra
antiarrhythmic medication of AF only (10% [n = 5] v
[n = 9], P = NS), atrial flutter only (18% [n = 9] v
[n = 3], P = NS), and combination of AF and atrial
(10% [n = 5] vs 6% [n = 3], P = NS). Similarl
significant difference was seen in the recurrence of
arrhythmias between groups I and II at 6 months (22
16%, P = NS) and at 12 months (20% vs 18%, P =
Eighty-five percent of patients in group I and 67% o
tients in group II with recurrences underwent redo abla
In the prosthetic valve group, 12 of 18 flutters wer
atrial and 6 were typical right atrial cavotricuspid is

1547-5271/$ -see front matter © 2011 Published by Elsevier Inc

Lakkireddy et al Heart Rhythm 2011

PVAI + LINES (IN PERSISTENT AF)





Number of patients at risk							
Group 1	45	23	22	16	13	13	11
Group 2	436	313	306	312	237	160	117

Number of patients at risk						
Group 1	45	35	35	25	22	18
Group 2	436	364	364	302	231	200

MULTIPLE PROCEDURE AND ANTIARRHYTHMIC DRUGS
NO DIFFERENCE IN COMPLICATIONS
MORE ATRIAL TACHYCARDIAS IN VHD

Miyazaki S ET AL JCE 2010

Dr. Callahan receives speaking honoraria from Biotronik and Boston Scientific. Dr. Lindsay is a consultant to Biosense Webster. All other authors have reported that they have no relationships to disclose.

Manuscript received January 1, 2011; revised manuscript received March 2, 2011, accepted March 21, 2011.

around the mitral annulus (T
from chronic mitral valve di
may potentially contribute
patients. We aimed to ev

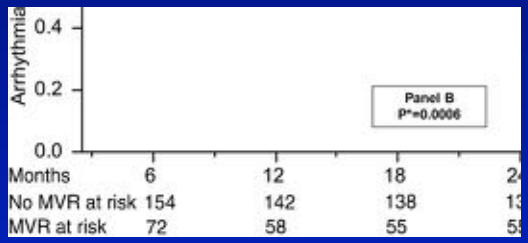


Figure 2 **Kaplan-Meier Curves for Arrhythmia-Free Survival After AF Ablation**

1 st P

Kaplan-Meier curves for arrhythmia-free survival after atrial fibrillation (AF tion in patients with mitral valve replacement (MVR) **(blue lines)** and wit MVR **(red lines)**. **(A)** Arrhythmia-free survival after a single ablation. **(B)** Arrh free survival after the last ablation (1.4 ± 0.6 vs. 1.2 ± 0.5 ablations p son in patients with and without MVR). *Log-rank test p value.

prosthetic valve damage, or entrapment of the ablation c within the prosthesis. The incidence of procedure complications were similar in both groups (Table 4).

Discussion

This is the largest study to date to evaluate the feas safety, and outcomes of AF ablation in patients with We have demonstrated that the procedure is feasible not associated with increased risk of complications, ularly no catheter entrapment occurred. An average ablations per patient was required to restore SR off rhythmic drugs in 70% of patients with MVR refer ablation. Also, ablative therapy allowed arrhythmia with medications that have previously failed in an adc 13% of patients. Only 17% continued to have drug-re AF. In a group of patients who have failed management, this may still be considered a clinical s However, the overall success rates of radiofrequenc

Last P

not associated with increased risk of complications, ularly no catheter entrapment occurred. An average ablations per patient was required to restore SR off rhythmic drugs in 70% of patients with MVR refer ablation. Also, ablative therapy allowed arrhythmia with medications that have previously failed in an adc 13% of patients. Only 17% continued to have drug-r AF. In a group of patients who have failed management, this may still be considered a clinical However, the overall success rates of radiofrequenc

No differences

Hussein et al JACC 2011

1547-5271/$ -see front matter © 2011 Heart Rhythm Society. All rights reserved. doi:10.101

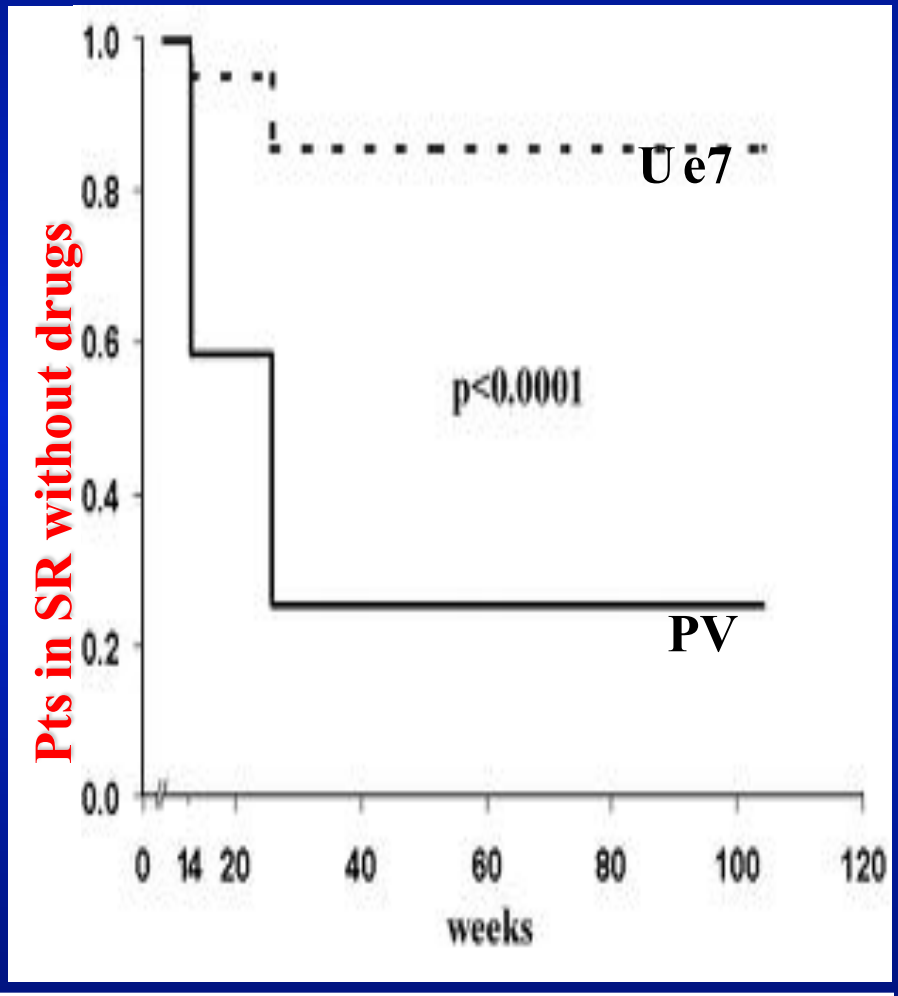
the procedure. Ablation was typically performed o
rin with a therapeutic international normalized rati
In cases in which the INR was subtherapeutic at a
during the 3 weeks before ablation, a transesophage
cardiogram was performed before ablation to exc
thrombus.

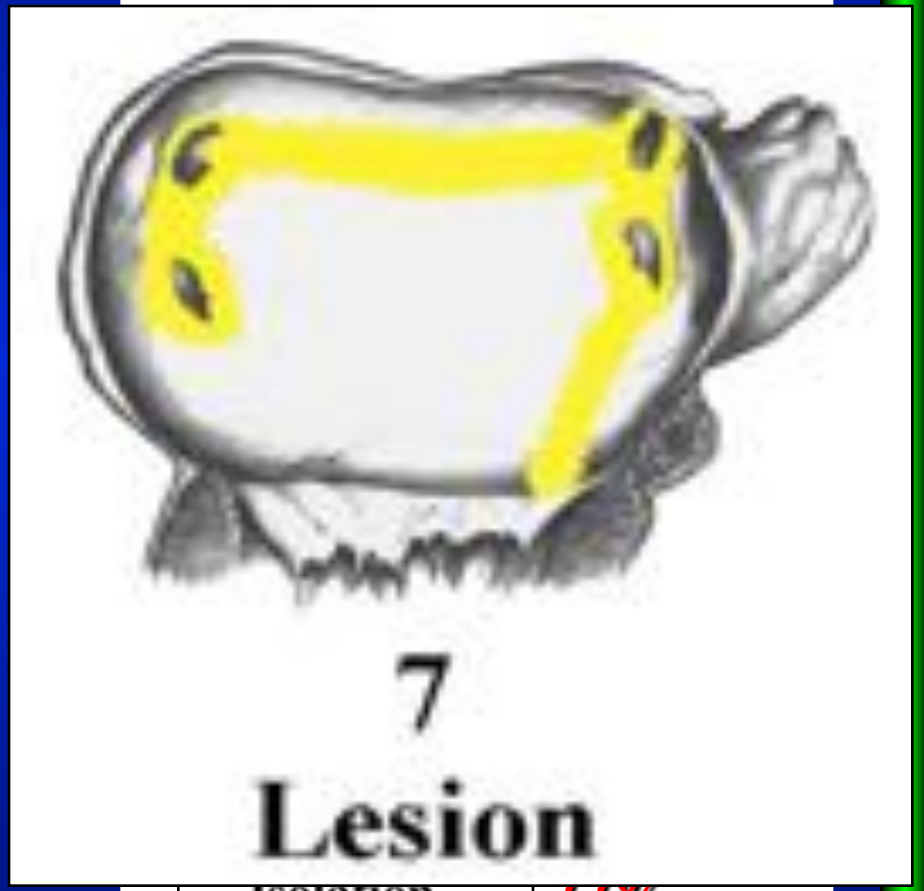
Two decapolar catheters with 5-mm electro
2-mm interelectrode spacing were placed in the
right atrium and coronary sinus (CS), with the
poles located at the CS ostium. A phased-array di
ultrasound catheter (5.5–10 MHz, 8 Fr, AcuNav,
Medical, Mountain View, CA) was advanced to the
the fossa ovalis in the right atrium. In cases in whi
flutter was the presenting rhythm, overdrive atria
was initially performed from the proximal and dist
determine their location relative to the tachycardi
and to exclude right atrial flutter. After excluding ri
flutter, heparin was initiated to achieve an activated
time of >350 seconds, and this was maintained thr

Mountantonakis et al Heart Rhythm 2011

SURGICAL CRIOABLATION

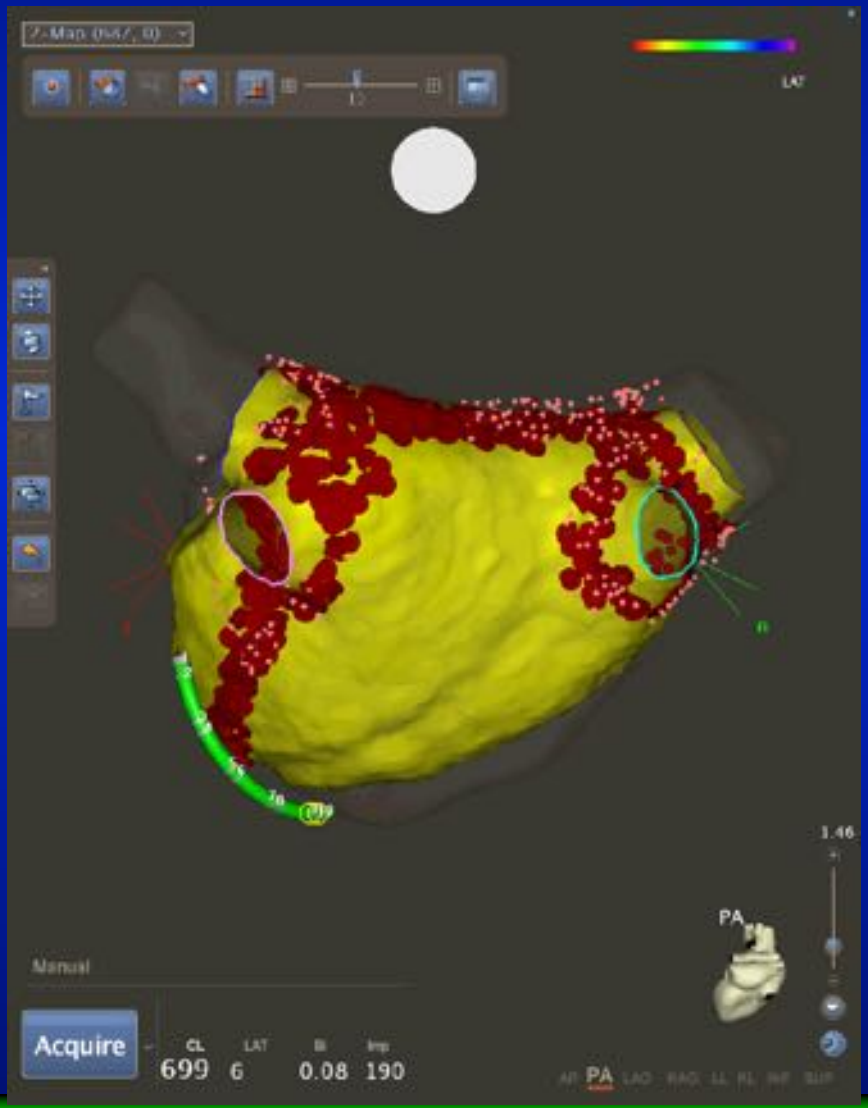
CHRONIC AF IN VALVULAR PATIENTS

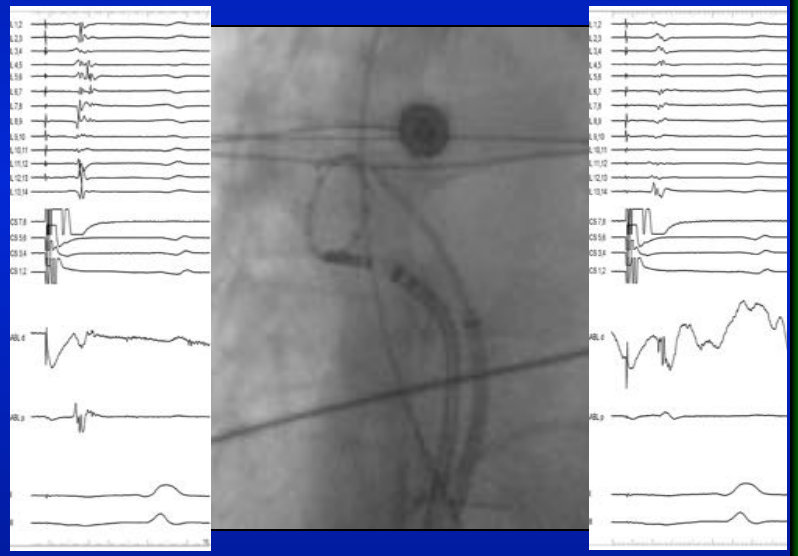




Gaita et Al. Circulation 2005. 18;111:136

“7” ablation scheme

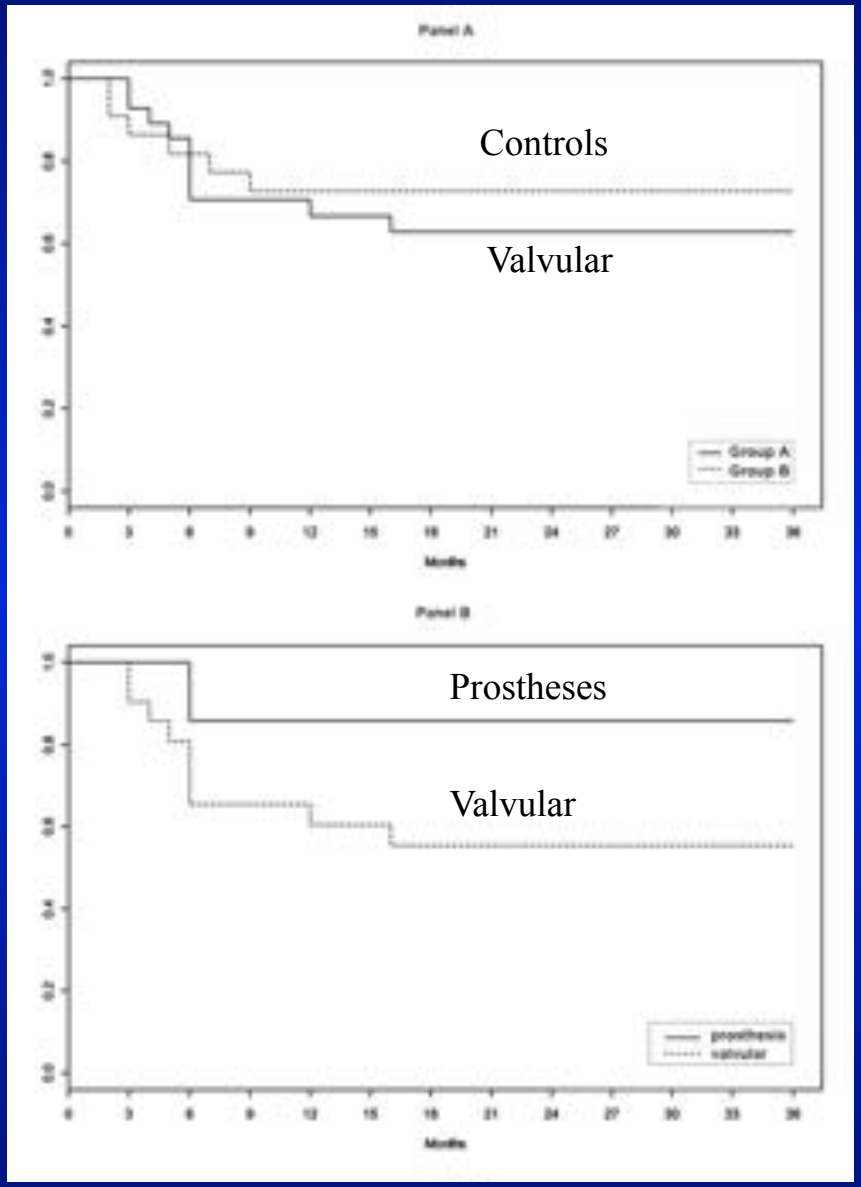




Scaglione et al Unpublished data

Scaglione et al. Unpublished data
55 Pts with long-term follow up

	Prosthetic population			Population with valvular disease		
	M	Ao	M + Ao	M	Ao	M + Ao
PAF	0	0	1	7	1	1
Pers AF	10	3	4	14	3	4
Perm AF	0	0	1	5	1	0
Stenosis	-	-	-	0	0	1
Regurgitation	-	-	-	24	4	5
Stenosis + Regurgitation	-	-	-	2	0	0



Results after 2 procedures

VALVULAR: 64% were in SR without AAD
follow-up 36 months

Non VALVULAR: 70% were in SR without AAD
follow up 36 months

VALVULAR: 56 % were in SR senza AAD
PROSTHESES: 88% were in SR without AAD
follow up 36 months

2) CONCLUSIONS:

AF ablation in valvular and prosthetic pts is feasible

…success rate seems to be less good if compared with non valv. pts, however is quite satisfactory

…complications rate is similar (non fatal complications higher in 1 report)

…requires higher Xray exposure

…F-up presents higher incidence of AT/flutter

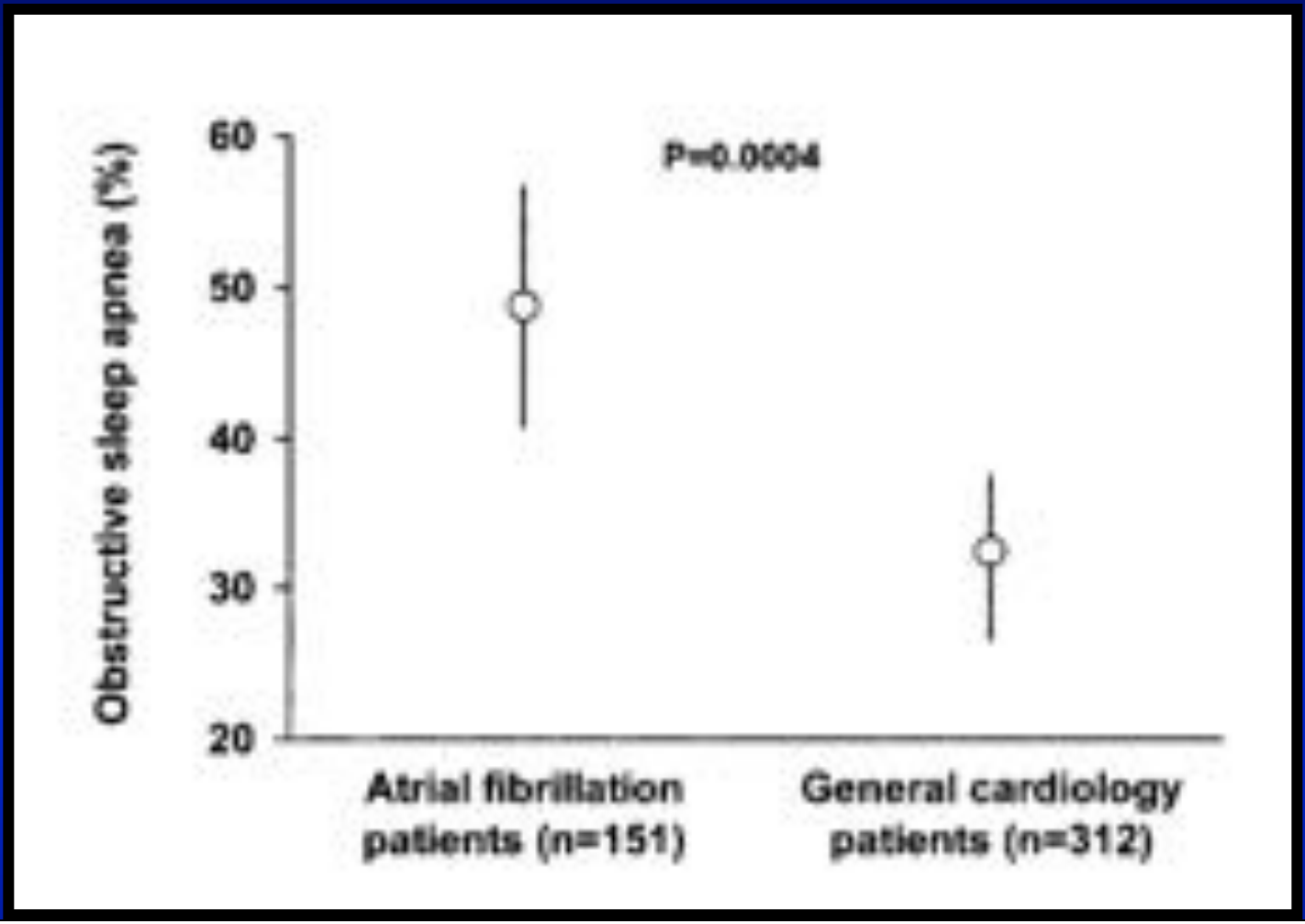
Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association

Association of Atrial Fibrillation and Obstructive Sleep Apnea

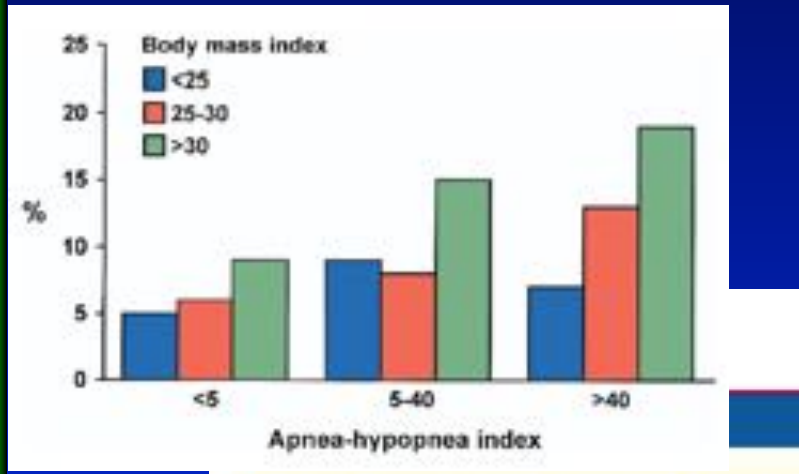
Apoor S. Gami, Gregg Pressman, Sean M. Caples, Ravi Kanagala, Joseph J. Gard, Diane E. Davison, Joseph F. Malouf, Naser M. Ammash, Paul A. Friedman and Virend K. Somers

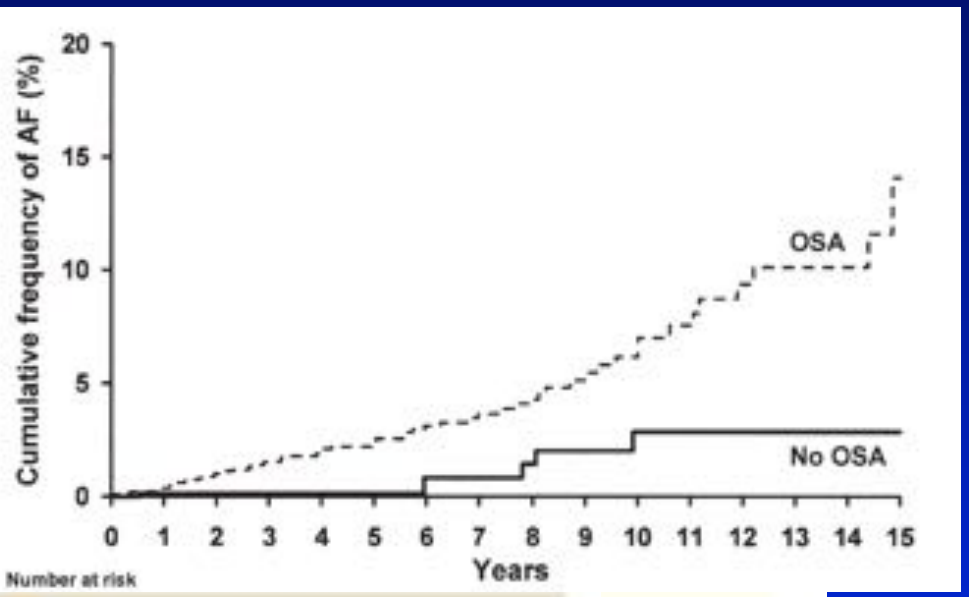
Circulation. 2004;110:364-367; originally published online July 12, 2004;
doi: 10.1161/01.CIR.0000136587.68725.8E



Prevalence of OSA is significantly higher in patients with AF than in patients without past or current AF

49% [95% CI 41% to 57%] vs 32% [95% CI 27% to 37%], p=0.0004





Obstructive Sleep Apnea

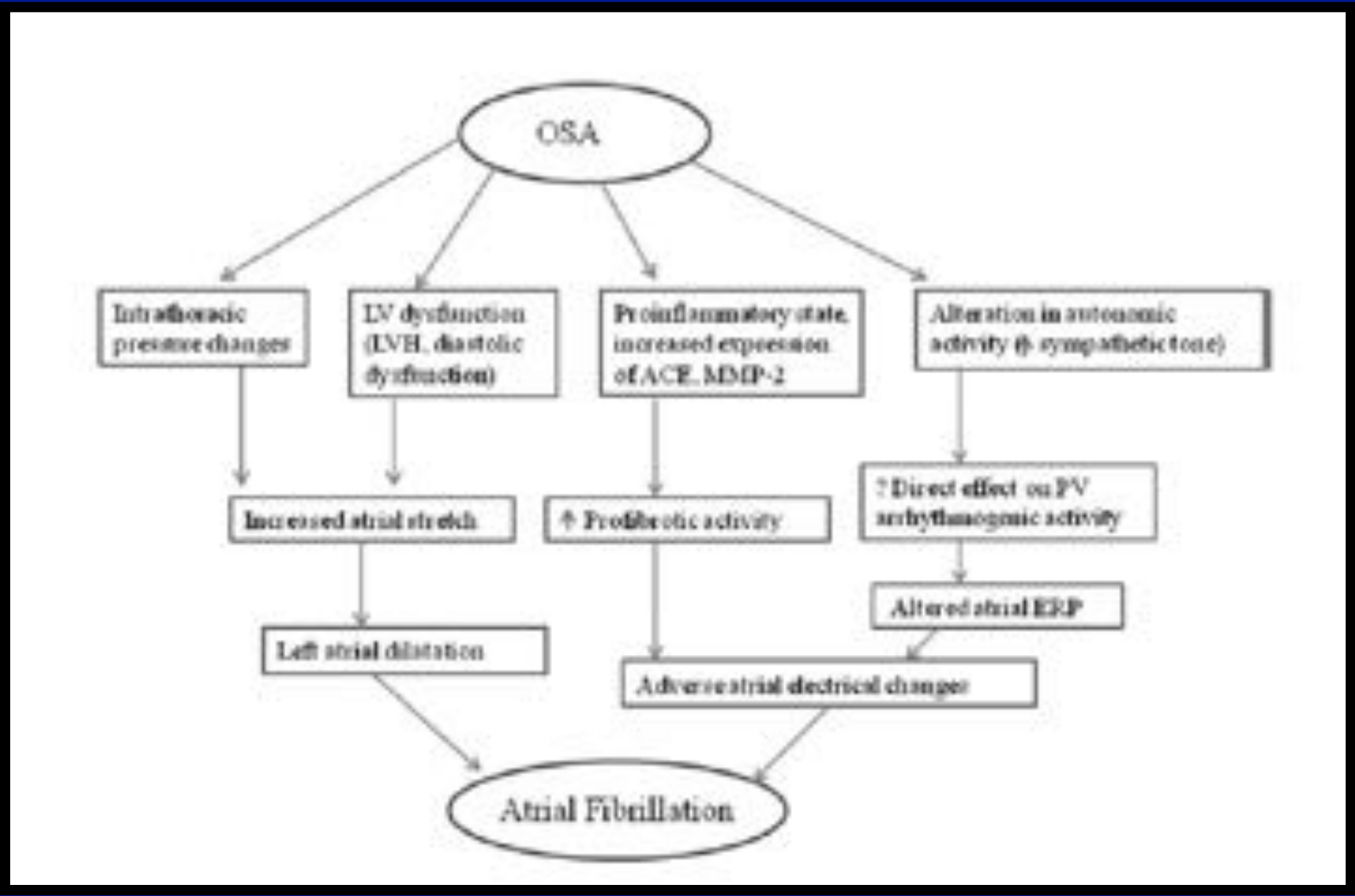
Table 3 Risk of Incident Atrial Fibrillation, Multivariate Models

	HR	95% CI	p Value
<65 yrs old			
Age (per 10 yrs)	2.04	1.48–2.80	<0.001
Male gender	2.66	1.33–5.30	0.006
Coronary artery disease	2.66	1.46–4.83	0.001
Body mass index (per 1 kg/m^2)	1.07	1.05–1.10	<0.001
Decrease in nocturnal oxygen saturation (per −1%)*	3.29	1.35–8.04	0.009
≥65 yrs old			
Heart failure	7.68	4.32–13.66	<0.001

*For a 0.5-U change in the logarithm of the difference between awake oxygen saturation and mean nocturnal oxygen saturation.

CI = confidence interval; HR = hazard ratio.

Contributory mechanisms for the pathogenesis of AF in the patients with OSA



Maan et al, Crit Pathways in Cardiol 2015; 14:81-85

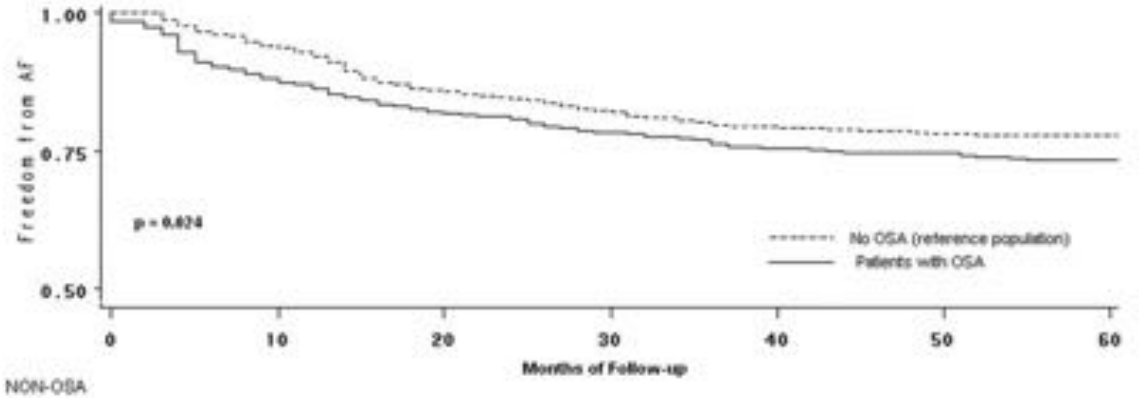
Circulation
Arrhythmia and Electrophysiology

American Heart Association.

Safety and Efficacy of Pulmonary Vein Antral Isolation in Patients With Obstructive Sleep Apnea: The Impact of Continuous Positive Airway Pressure

Dimpi Patel, Prasant Mohanty, Luigi Di Biase, Mazen Shaheen, William R. Lewis, Kara Quan, Jennifer E. Cummings, Paul Wang, Amin Al-Ahmad, Preeti Venkatraman, Eyad Nashawati, Dhanunjaya Lakkireddy, Robert Schweikert, Rodney Horton, Javier Sanchez, Joseph Gallinghouse, Steven Hao, Salwa Beheiry, Deb S. Cardinal, Jason Zagrodzky, Robert Canby, Shane Bailey, J. David Burkhardt and Andrea Natale

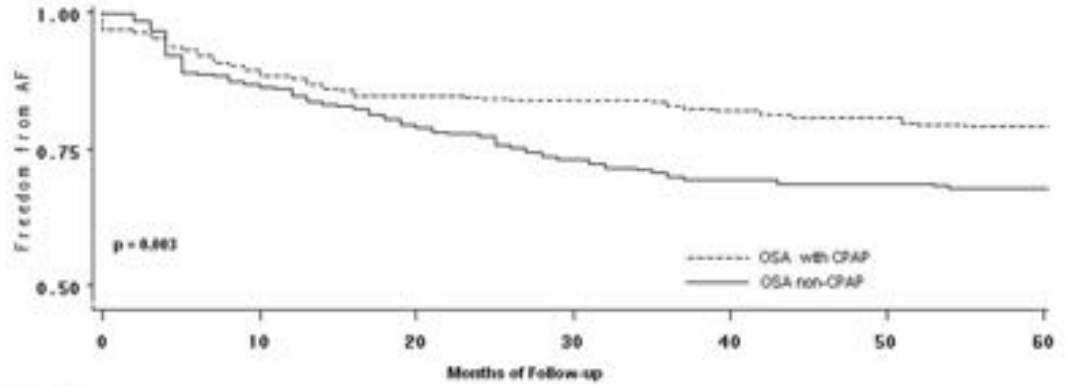
Circ Arrhythm Electrophysiol. 2010;3:445-451; originally published online August 5, 2010;
doi: 10.1161/CIRCEP.109.858381



NON-OSA							
# at risk	2360	2217	1898	1338	379	352	341
AF-free (95%CI)	1	0.94 (.92-.95)	0.86 (.83-.88)	0.82 (.80-.84)	0.79 (.77-.82)	0.78 (.75-.81)	0.78 (.75-.80)
OSA							
# at risk	640	569	492	319	192	160	155
AF-free (95%CI)	1	0.87 (.85-.90)	0.82 (.79-.85)	0.78 (.75-.81)	0.75 (.72-.78)	0.74 (.71-.77)	0.73 (.70-.77)

Figure 2. Kaplan-Meier curve comparing freedom from AF recurrence among patients with and without OSA.

78% vs 73%, p=0.024



No CPAP							
# at risk	325	277	230	181	90	89	84
AF-free (95%CI)	1	0.86 (.82-.90)	0.79 (.74-.83)	0.73 (.69-.78)	0.69 (.64-.74)	0.68 (.63-.73)	0.68 (.62-.73)
On CPAP							
# at risk	315	282	258	134	103	76	71
AF-free (95%CI)	1	0.89 (.85-.92)	0.85 (.81-.89)	0.84 (.80-.88)	0.82 (.78-.86)	0.80 (.75-.84)	0.79 (.75-.84)

Figure 3. Kaplan-Meier curve showing probability of AF-free survival among patients with OSA+CPAP and OSA patients without CPAP.

79% vs 68%, p=0.003

Journal of the American College of Cardiology
© 2013 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 62, No. 4, 2013
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2013.03.052

Heart Rhythm Disorders

Treatment of Obstructive Sleep Apnea Reduces the Risk of Atrial Fibrillation Recurrence After Catheter Ablation

Adam S. Fein, MD, Alexei Shvilkin, MD, PhD, Dhaval Shah, MD, Charles I. Haffajee, MD, Saumya Das, MD, Kapil Kumar, MD, Daniel B. Kramer, MD, Peter J. Zimetbaum, MD, Alfred E. Buxton, MD, Mark E. Josephson, MD, Elad Anter, MD

Boston, Massachusetts

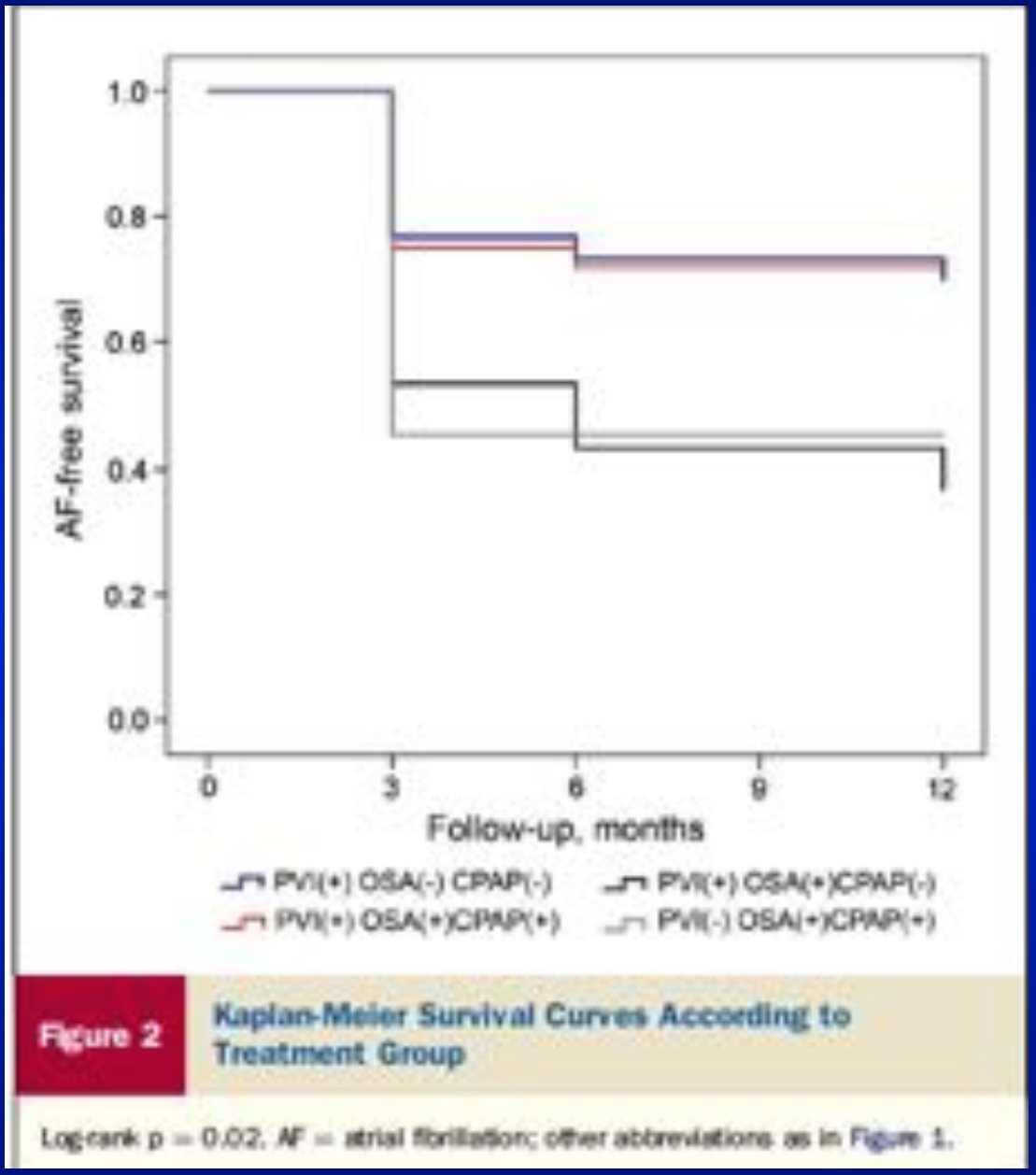


Figure 2 Kaplan-Meier Survival Curves According to Treatment Group

Log-rank p = 0.02. AF = atrial fibrillation; other abbreviations as in Figure 1.

CPAP therapy:

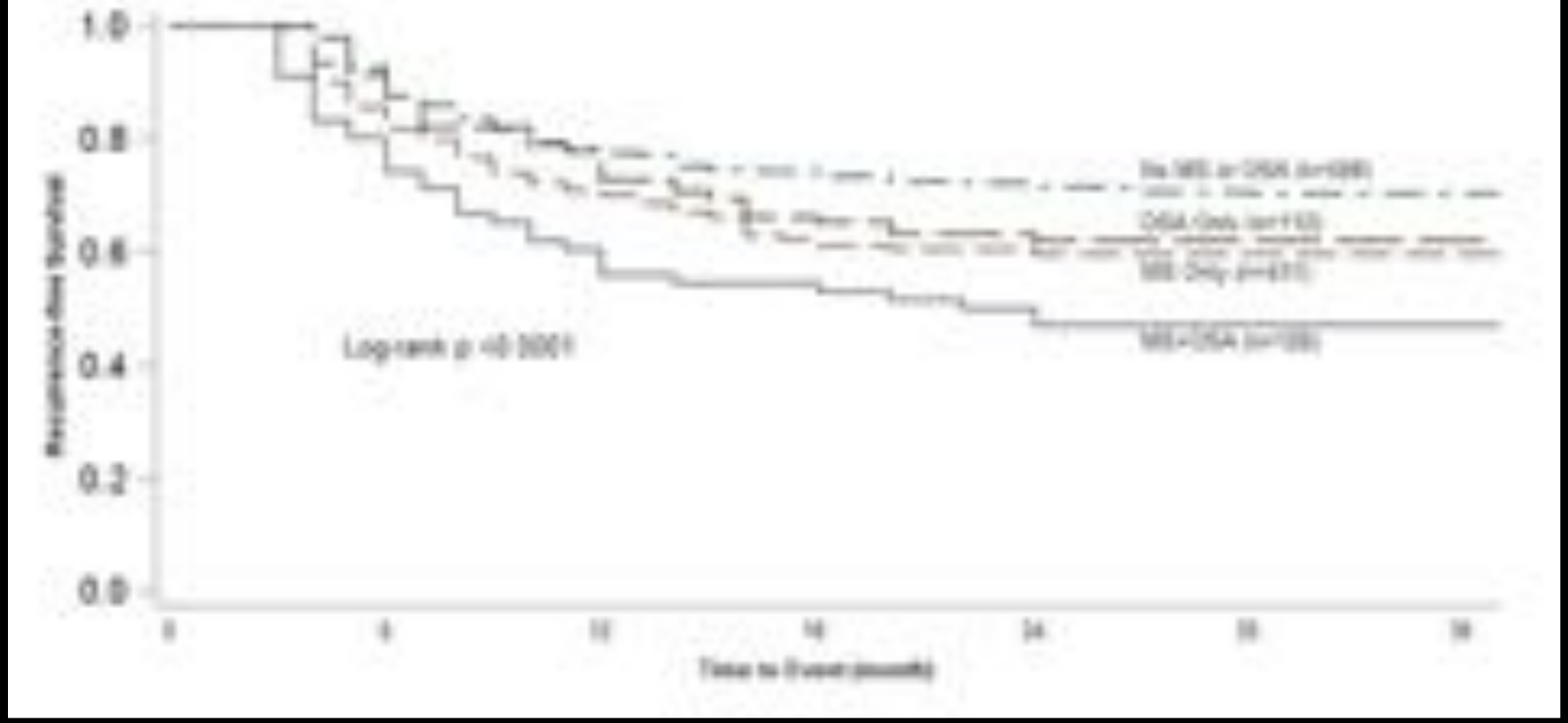
- ↑AF free survival rate (71.9% vs 36.7%, p=0.01)

- ↑AF-free survival off AAD or redo ablations (65.6% vs 33.3%, p=0.02)

AF recurrence rate of CPAP patients was similar to a group of patients without OSA (HR0.7, p=0.46)

Long-Term Outcome of Catheter Ablation in Atrial Fibrillation Patients with Coexistent Metabolic Syndrome and Obstructive Sleep Apnea: Impact of Repeat Procedures versus Lifestyle Changes

SANGHAMITRA MOHANTY, M.D., M.S., F.H.R.S.,*,† PRASANT MOHANTY, M.B.B.S., M.P.H.,* LUIGI DI BIASE, M.D., Ph.D., F.H.R.S.,*,‡,§,¶ RONG BAI, M.D., F.H.R.S.,*,# CHINTAN TRIVEDI, M.D., M.P.H.,* PASQUALE SANTANGELI, M.D.,*,§ FRANCESCO SANTORO, M.D.,§ RICHARD HONGO, M.D.,‖ STEVEN HAO, M.D.,‖ SALWA BEHEIRY, R.N.,‖ DAVID BURKHARDT, M.D.,* JOSEPH G. GALLINGHOUSE, M.D.,* RODNEY HORTON, M.D.,* JAVIER E. SANCHEZ, M.D.,* SHANE BAILEY, M.D.,* PATRICK M. HRANITZKY, M.D.,* JASON ZAGRODZKY, M.D.,* and ANDREA NATALE, M.D., F.H.R.S., F.E.S.C., F.A.C.C.*,‡,‖,**,††,‡‡



Europace (2014) 16, 1309–1314
doi:10.1093/europace/euu066

Efficacy of catheter ablation of atrial fibrillation in patients with obstructive sleep apnoea with and without continuous positive airway pressure treatment: a meta-analysis of observational studies

Li Li[1]*, Zeng-wu Wang[2], Jie Li[1], Xing Ge[1], Li-zhu Guo[1], Ying Wang[1], Wei-hua Guo[1], Chen-xi Jiang[3], and Chang-sheng Ma[1,3]*

Table 1 Study characteristics

Publication year and principal investigator	Study method	AF treatment method	OSA diagnostic method	OSA treatment method	Detection methods of AF recurrence	Loss to follow-up (*n*)	Interval of follow-up (months)	Quality score
2008 Jongnarangsin *et al.*[8]	Retrospective observation	Ablation: PV CFAE	PSG	CPAP	Self-report	0	7	8
2010 Patel *et al.*[9]	Retrospective evaluation	Ablation: PV, LA posterior wall or superior vena cava	PSG	CPAP	Documented AF	0	20	9
2010 Matiello *et al.*[1]	Retrospective observation	Ablation: PV, LA roof and posterior wall	BQ PSG	CPAP	Documented AF	0	12	8
2013 Fein *et al.*[10]	Retrospective observation	Ablation: PV	PSG	CPAP	Documented AF	0	12	9
2013 Naruse *et al.*[16]	Prospective case–control	Ablation: PV, LA posterior wall, or superior vena cava	PSG	CPAP	Documented AF	0	18	9

BQ, Berlin questionnaire; CFEA, complex fractionated atrial electrogram; LA, left atrial; PSG, polysomnography; PV, pulmonary vein isolation; AF, atrial fibrillation; OSA, obstructive sleep apnoea.

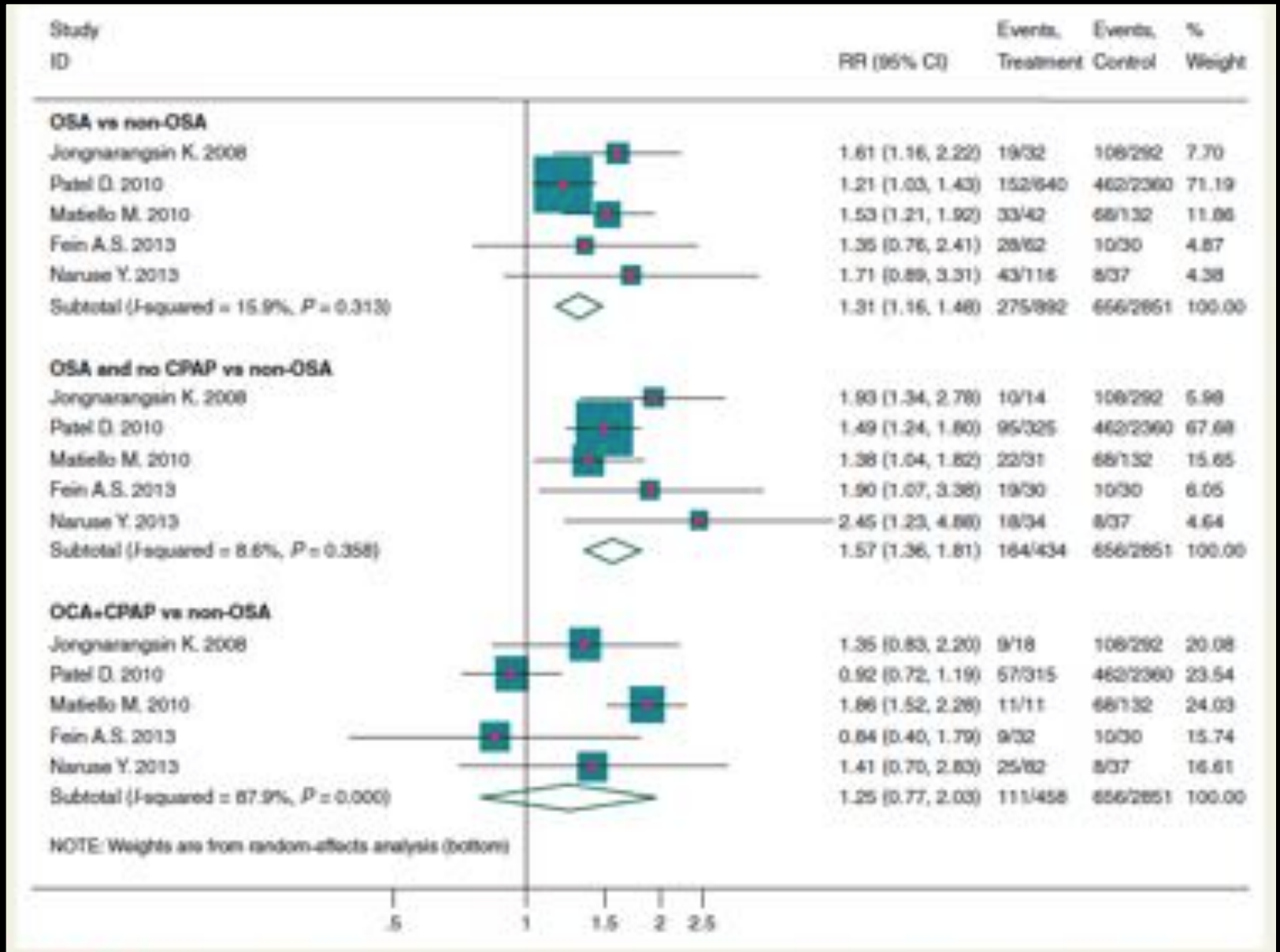


Figure 2 Forest plot in the comparison of AF recurrence after catheter ablation in patients with OSA and non-OSA (top), OSA and no CPAP vs non-OSA (middle), OSA + CPAP and non-OSA (bottom).

3) CONCLUSIONS:

AFib ablation success in OSAS is less good than in controls

…CPAP after ablation is able to reduce this success gap

Catheter Ablation of Atrial Fibrillation in Patients With Chronic Lung Disease

Seung-Young Roh, MD; Jong-Il Choi, MD, PhD; June Young Lee, PhD; Jae-Jin Kwak, MD; Jae-Seok Park, MD; Ji-Bak Kim, MD; Hong-Euy Lim, MD, PhD; Young-Hoon Kim, MD, PhD

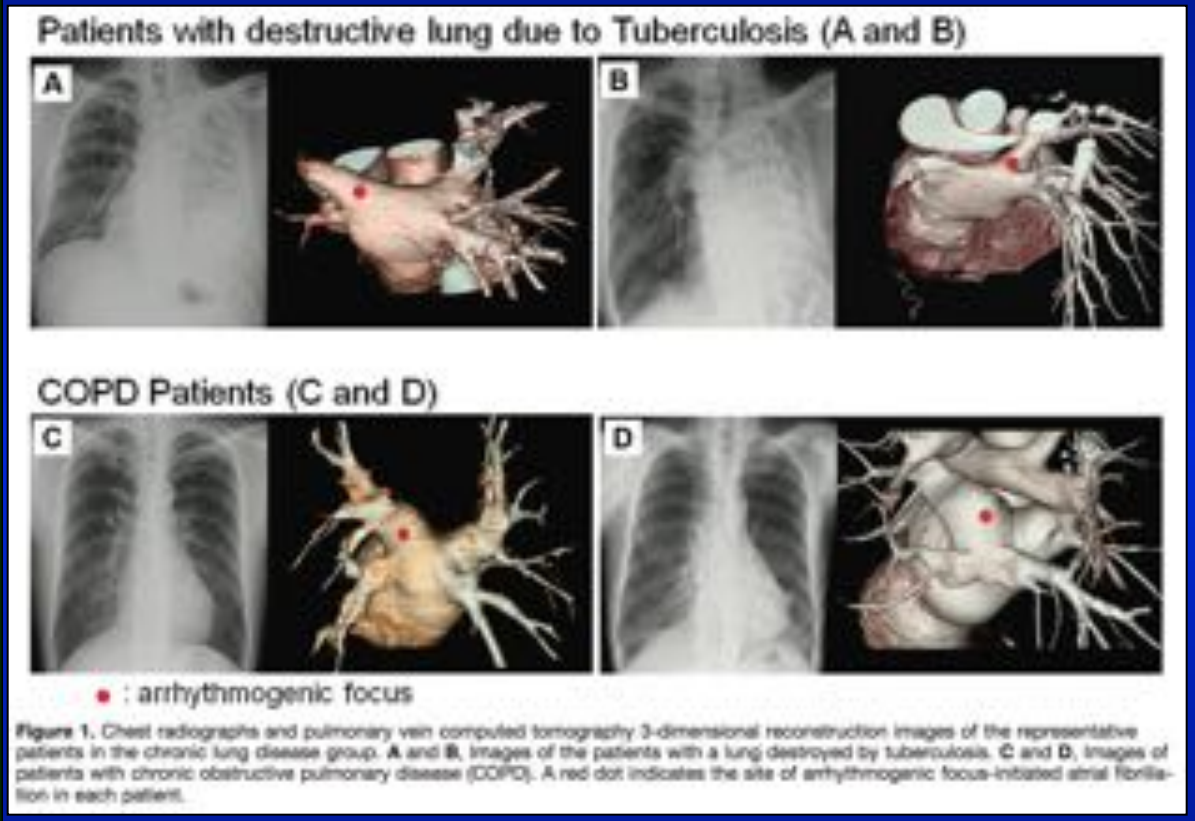


Figure 1. Chest radiographs and pulmonary vein computed tomography 3-dimensional reconstruction images of the representative patients in the chronic lung disease group. **A** and **B**, Images of the patients with a lung destroyed by tuberculosis. **C** and **D**, Images of patients with chronic obstructive pulmonary disease (COPD). A red dot indicates the site of arrhythmogenic focus-initiated atrial fibrillation in each patient.

Circ Arrhyth Electrophysiol 2011

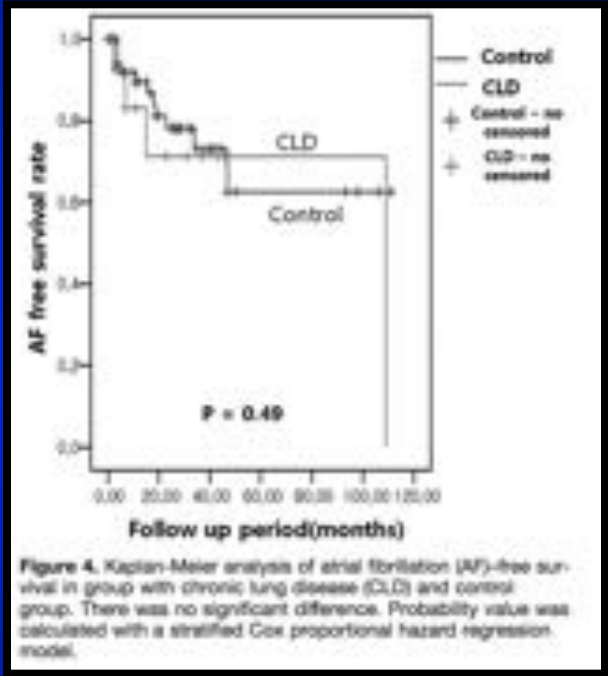
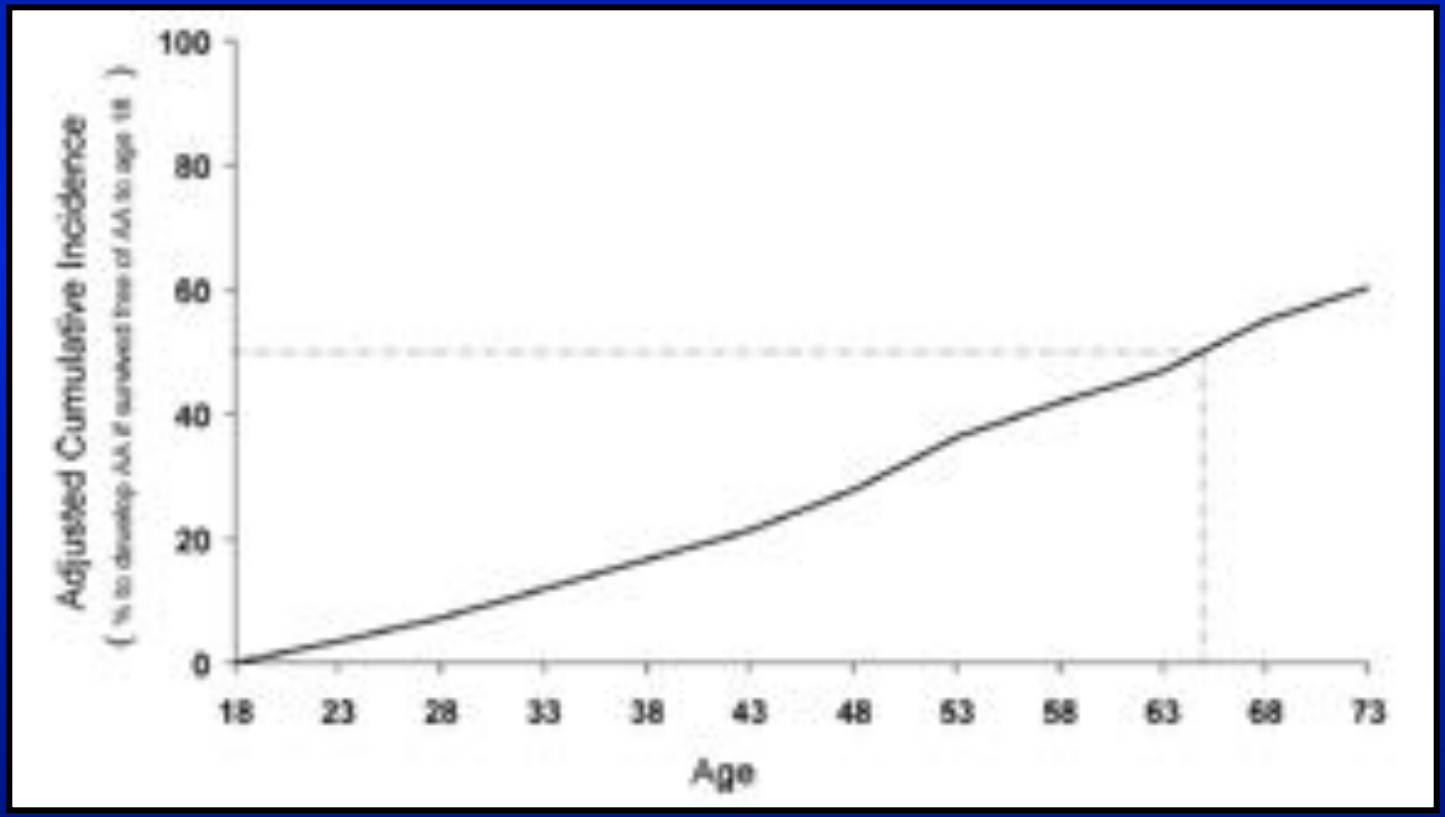


Figure 4. Kaplan-Meier analysis of atrial fibrillation (AF)-free survival in group with chronic lung disease (CLD) and control group. There was no significant difference. Probability value was calculated with a stratified Cox proportional hazard regression model.

AF pts with CLD have significant alterations in PV anatomy related to foci. Higher prevalence of RA foci. RFCA can be performed safely with a comparable success rate to that in patients with normal lungs.

Atrial Arrhythmias in Adults with Congenital Heart Disease:
Age Distribution



Bouchardhy et al; Circulation 2009; 120:1679-1686

Interventional Electrophysiology in Patients With Congenital Heart Disease

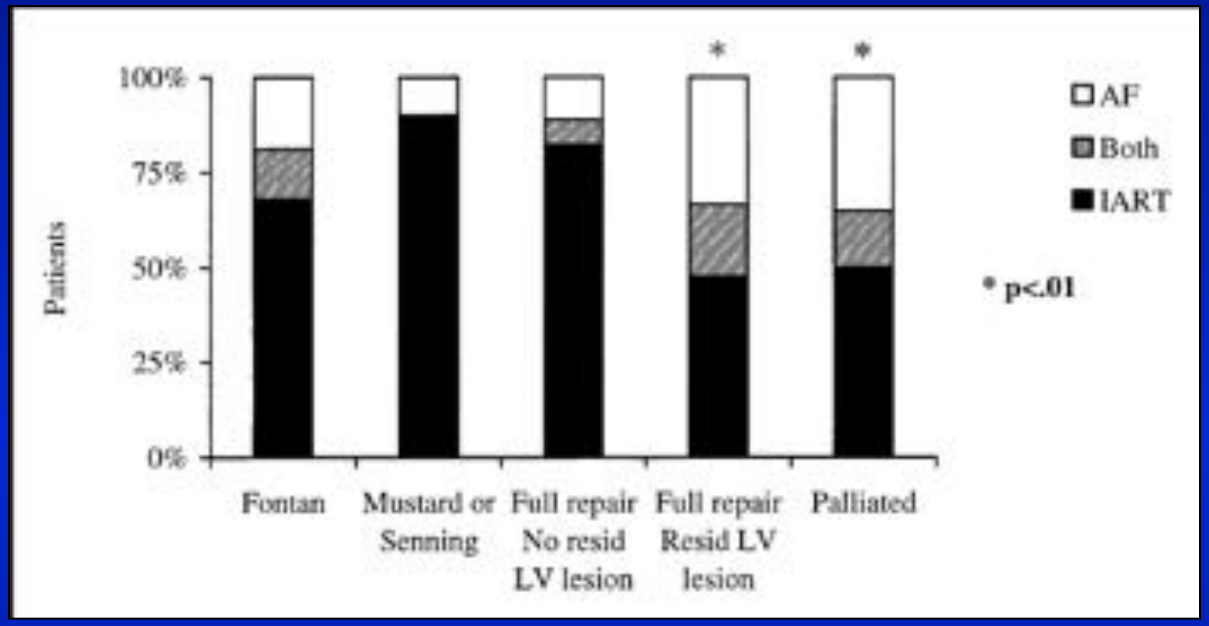
Relative Risk for Specific Arrhythmias in Common Congenital Heart Defects

	IART	AF	WPW	VT/SCD	SA Node Dysfunction	Spontaneous AV Block	Traumatic AV Block
VSD	+			+			+
ASD	+	+					
TOF	+ +			+ +			+
AS		+		+ +			+
D-TGA (M&S)	+ + +			+ +	+ + +		
CAVC	+					+	+ +
SIMG V (F)	+ + +	+		+	+ + +		
L-TGA	+		+ +	+		+ +	+ + +
Ebstein's anomaly	+ +		+ + +	+			

AF indicates atrial fibrillation; WPW, Wolff-Parkinson-White syndrome; SCD, sudden cardiac death; SA, sinoatrial; VSD, ventricular septal defect; ASD, atrial septal defect; TOF, tetralogy of Fallot; AS, aortic stenosis; M&S, after the Mustard or Senning operation; CAVC, common AV canal defect; SIMG V (F), single ventricle after the Fontan operation; + + +, high risk; + +, moderate risk; and +, slight risk.

P. Walsh Circulation 2007

Prevalence of AF and IART in Congenital Heart Disease



- ✓ Up to a third of patients with CHD and atrial tachycardia who require cardioversion may have AF
- ✓ Patients with significant and unrepaired lesion may be relatively more prone to AF

Kirsh JA et al, *Am J Cardiol* 20002;90:338-340

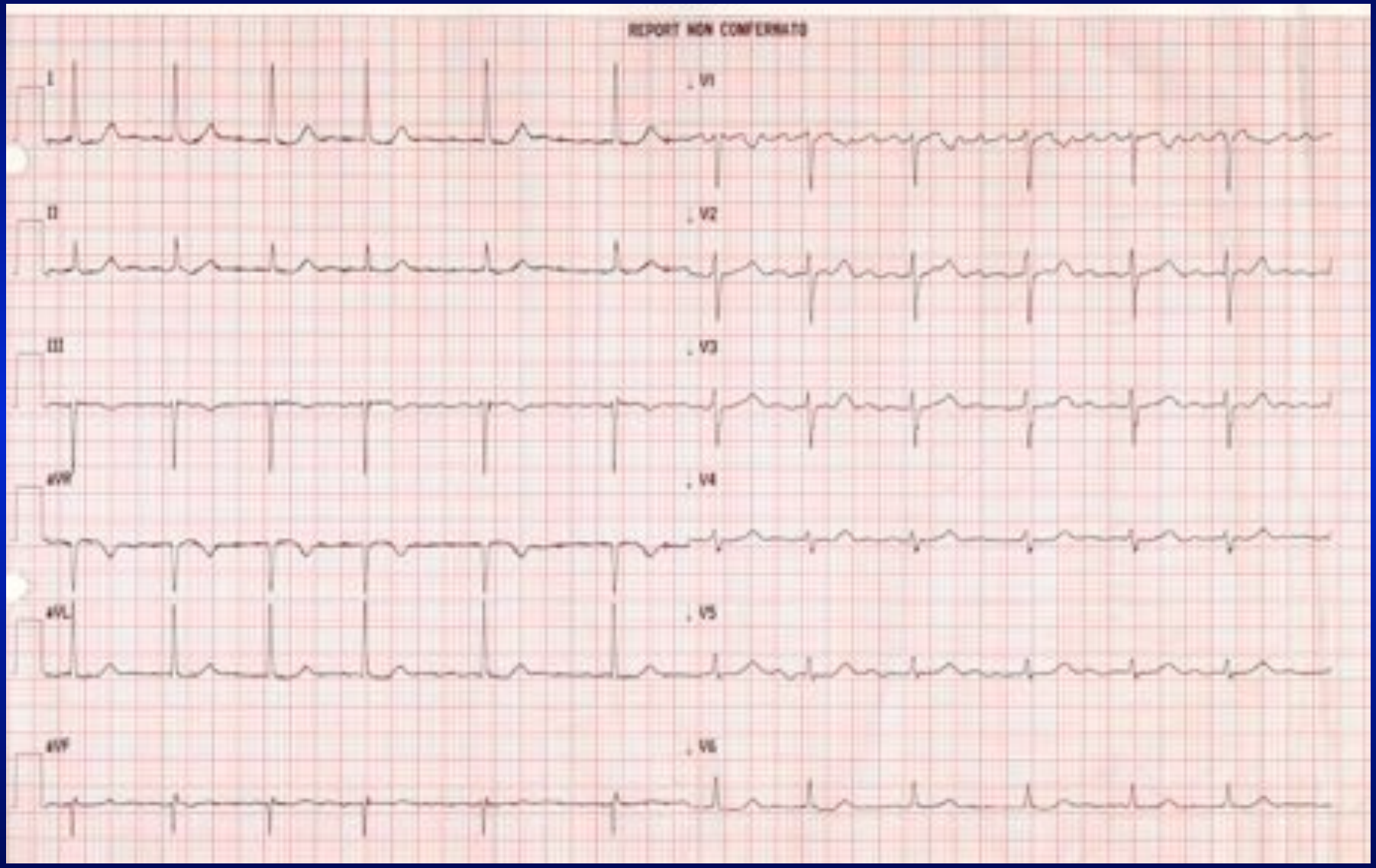
Clinical case

R.G. Male, 66 y
Diabetes mellitus, smoker, hiatal hernia, previous dysthyroidism.

Congenital heart disease: interatrial septal defect (ostium primum) and pulmonary valve stenosis > surgical repaire in 1986 (39y)

1997 (50y) Atrial flutter→ EP study → typical atrial flutter → *IVC-TA isthmus ablation*

2010 (63y) new episodes of atrial flutter/AF (pharmacological CV with propafenone/amiodarone) → prophylaxis with propafenone 325 mg bid → very frequent AF episodes →
indication to ablation


REPORT NON CONFERMATO
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


I
II
aVR
V1
V4
V6
CS 9,10
CS 7,8
CS 5,6
CS 3,4
CS 1,2

Update on Interventional Electrophysiology in Congenital Heart Disease

Evolving Solutions for Complex Hearts

Ablation for AF in CHD

As mentioned, AF is emerging as a more significant problem as patients with CHD attain older ages.[12] There is now a small but growing literature describing catheter ablation of AF for this population. Most cases have involved fairly straightforward lesions, such as atrial septal defects,[45,46] although a few reports of more complex anatomy also exist. One item that may set these cases apart from more conventional AF ablation in a structurally normal heart is the challenge of achieving left atrial access across patches and septal occlusion devices, but there is now ample evidence that this can be accomplished safely.[23,45,46] Catheter ablation for AF will almost certainly become a more common intervention for CHD in the near future.

Sherwin et al; *Circ Arrhythm Electrophysiol*. 2013

Europace (2014) 16, 1800–1807
doi:10.1093/europace/euu076

CLINICAL RESEARCH
Electrophysiology and ablation

Very long-term results of electroanatomic-guided radiofrequency ablation of atrial arrhythmias in patients with surgically corrected atrial septal defect

Table 1 Baseline characteristics

Males/females	18/28
Patients' mean age (years)	49 ± 13
Patients' mean age at surgery (years)	25 ± 13
Defect type	
Ostium secundum ASD	41/46
Ostium primum ASD	5/46
Known correction modality	28/46
Autologous/synthetic patch	17/28
Continuous suture	10/28
Combined approach	1/28
Second surgical intervention	6/46
Surgical reintervention on ASD	3/6
Percutaneous closure of ASD	1/6
Botallo duct closure	1/6
Right outflow tract reconstruction	1/6

Scaglione et al EUROPACE 2014

Europace (2014) 16, 1800–1807
doi:10.1093/europace/euu076

CLINICAL RESEARCH
Electrophysiology and ablation

Very long-term results of electroanatomic-guided radiofrequency ablation of atrial arrhythmias in patients with surgically corrected atrial septal defect

Arrhythmia's onset after surgery (years)	19 ± 12
Symptoms	40/46
Arrhythmia	
Typical atrial flutter	22/46
Atypical atrial flutter	16/46
Atrial tachycardia	8/46

AF present in 40 % of pts

Scaglione et al EUROPACE 2014

Long Term Ablation Results (FU 7 ± 3.8 y)

Successful single ablation procedure
35/46 (76%)

I

46 pts

12 CTI

5 right atrial lesions (RAL)

29 CTI + RAL

OVERALL RESULTS

Success without AAD 40/46 (87%)

Success with AAD 44/46 (96%)

Consent denied 2/46 (4%)

Nn induc -> AAD

III

2 Recurrences
(1 RAL, 1 Atypical A Fl)

Pulmonary Vein Isolation for the Treatment of Drug-Refractory Atrial Fibrillation in Adults with Congenital Heart Disease

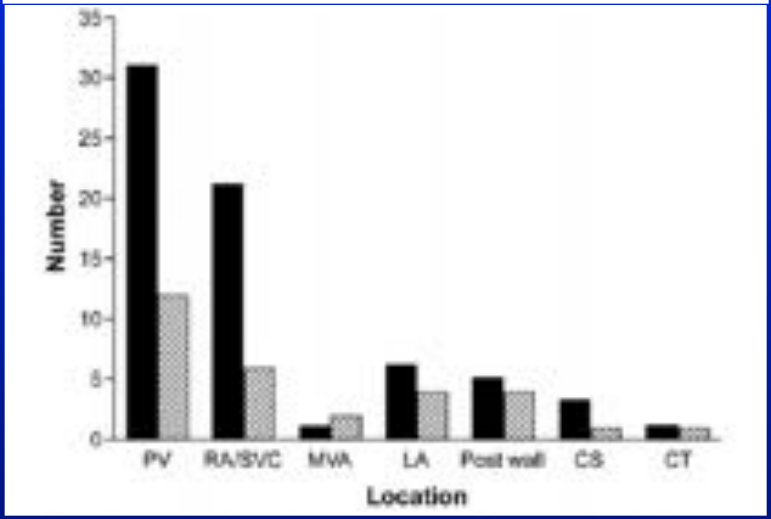
Congenital Heart Disease (36pts)

- Atrial septal defect 22 (61%)
- Ventricular septal defect 6 (17%)
- Tetralogy of Fallot 1 (3%)
- Double outlet left LV and TGA 1 (3%)
- Coartation of aorta 1 (3%)
- Epstain anomaly 3 (8%)
- Bland-Garland White Syndrome 2 (6%)

Noncongenital Structural Heart Disease (355):

- Coronary artery disease
- Valvular heart disease
- EF <50%
- Prior noncongenital cardiac surgery

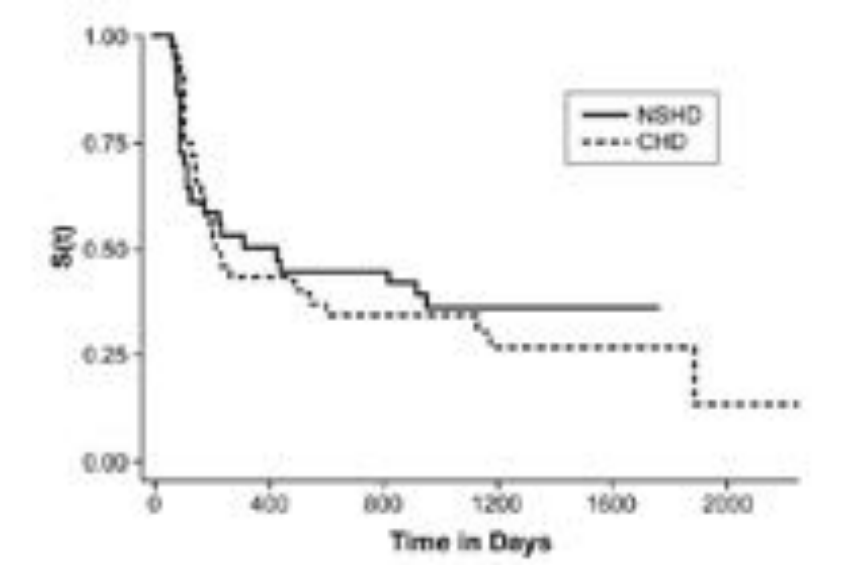
AF Ablation



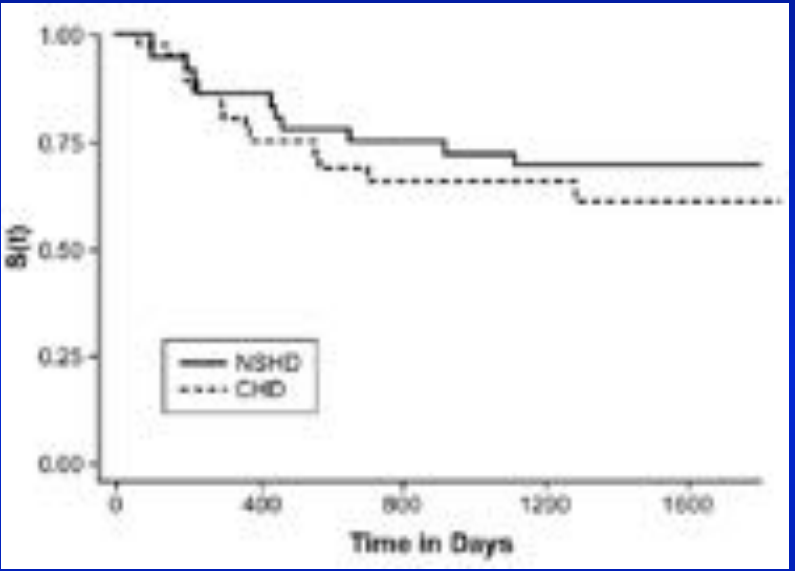
Philip F et al; Congenit Heart Dis 2012;7:392-399

Pulmonary Vein Isolation for the Treatment of Drug-Refractory Atrial Fibrillation in Adults with Congenital Heart Disease

Success off ADD



Success on ADD



Two pts with Tetralogy of Fallot and TGA failed ablation attempts "as many of the ablation catheters were not designed to reach the left atrium and PVI"

Complications n (%)	CHD n = 36	NSHD n = 355	*P* value
Mean	6 (17%)	38 (11%)	.42
Vascular access site	3 (8%)	5 (1%)	<.05
Embolic event	1 (3%)	0 (0%)	.5
Pulmonary stenosis	2 (5%)	29 (8%)	.47
Stroke	0 (0%)	4 (1%)	.5

Philip F et al; Congenit Heart Dis 2012

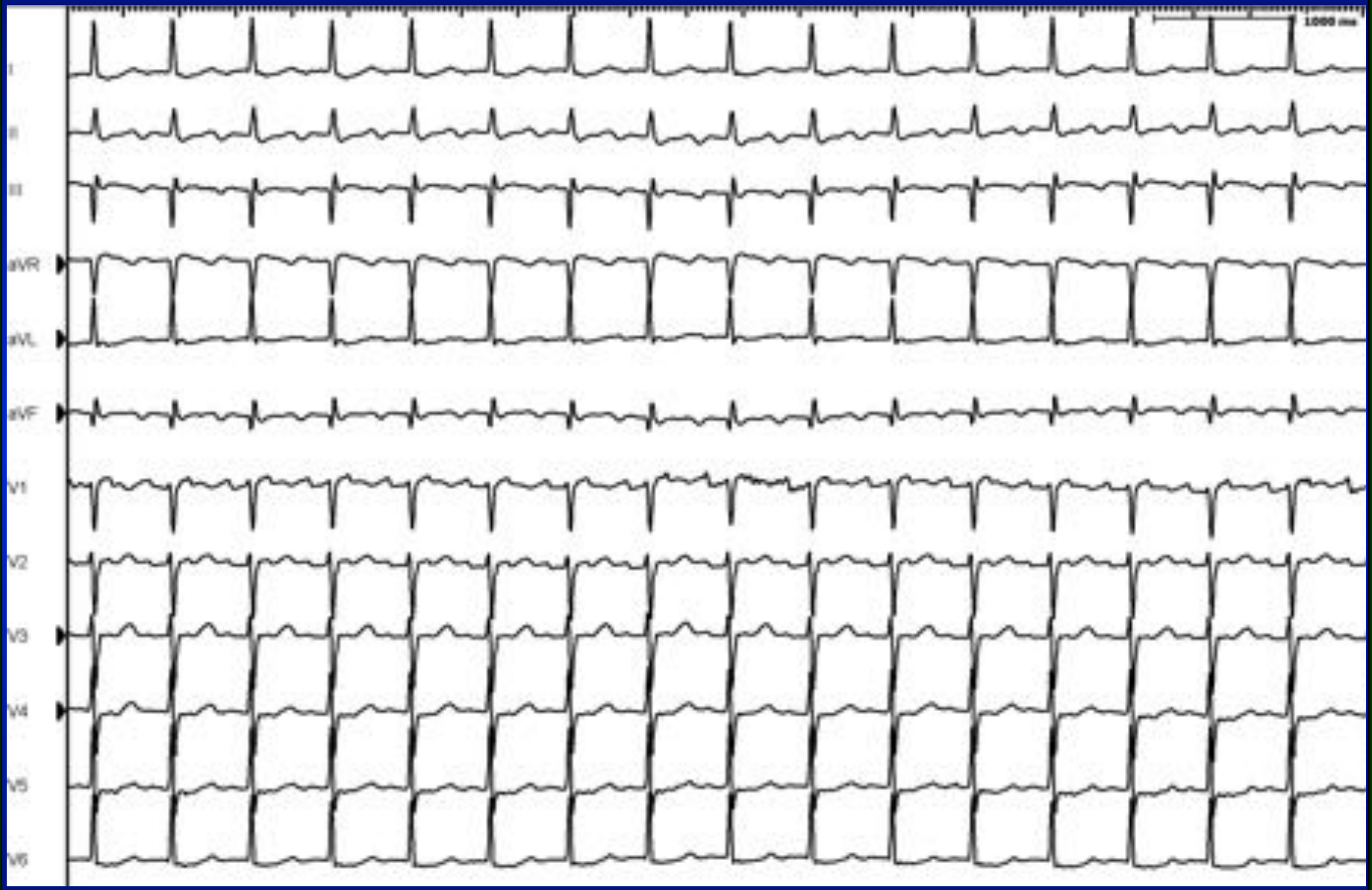
Clinical case

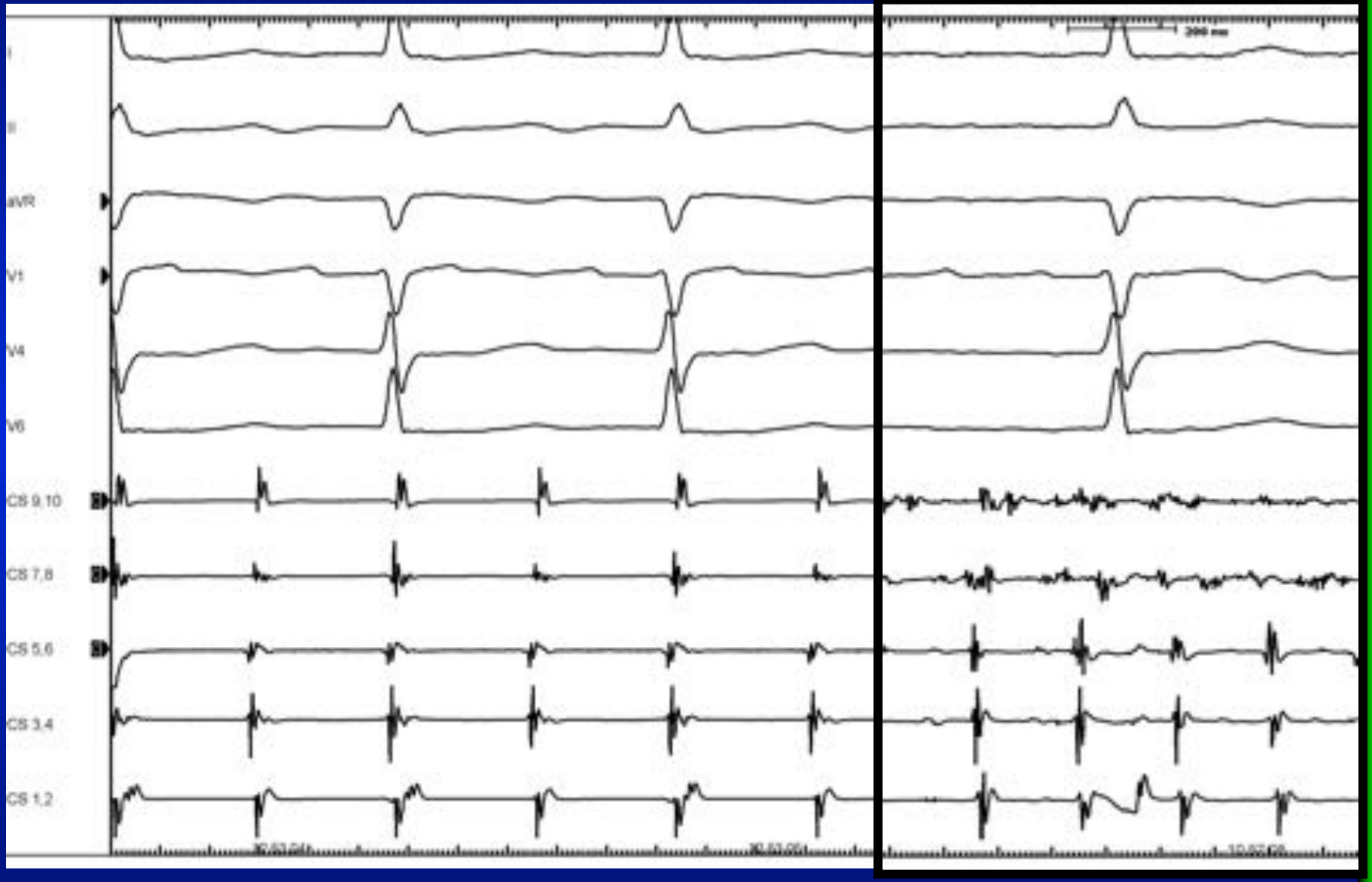
R.G. Male, 66 y
Diabetes mellitus, smoker, hiatal hernia, previous dysthyroidism.

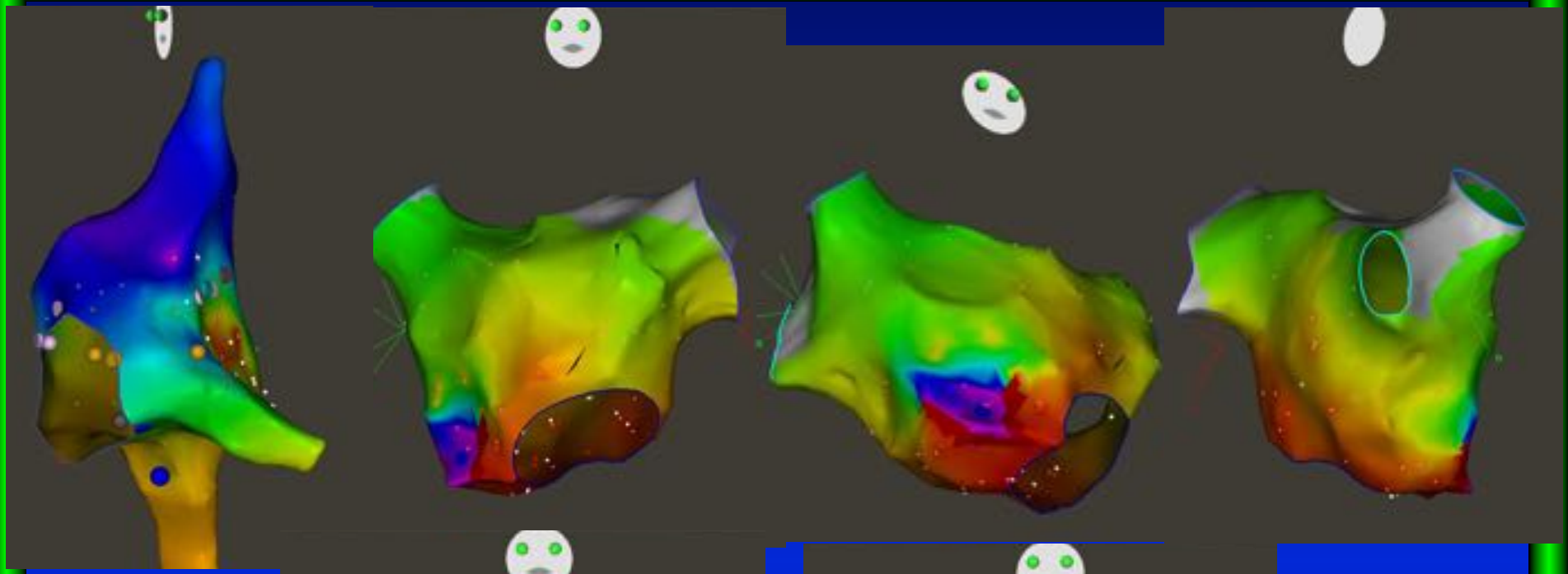
Congenital heart disease: interatrial septal defect (ostium primum) and pulmonary valve stenosis > surgical repaire in 1986 (39y)

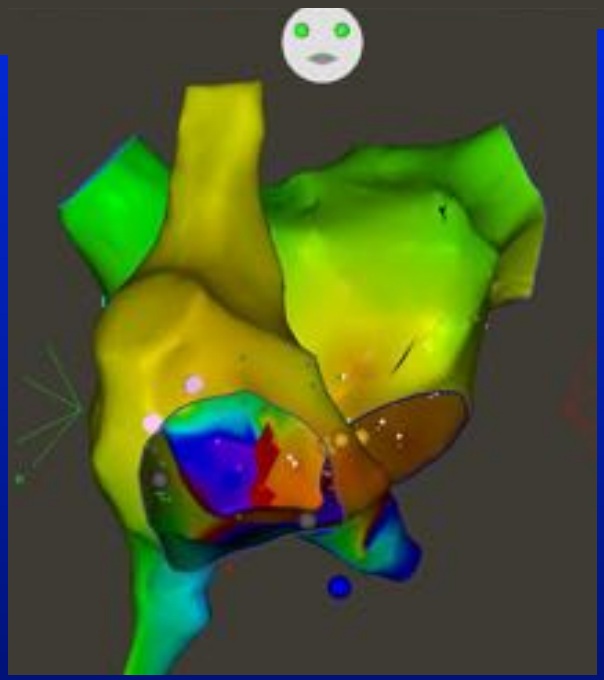
1997 (50y) Atrial flutter→ EP study → typical atrial flutter → *right isthmus ablation*

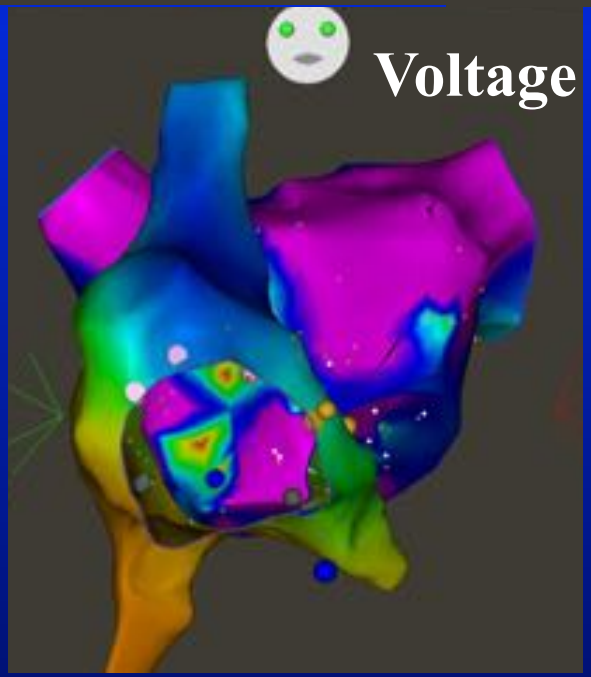
2010 (63y) new episodes of atrial flutter/AF (pharmacological CV with propafenone/amiodarone) → prophylaxis with propafenone 325 mg bid → very frequent AF episodes → *indication to ablation*


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


I
II
aVR
V1
V4
V6
CS 9,10
CS 7,8
CS 5,6
CS 3,4
CS 1,2
300 ms

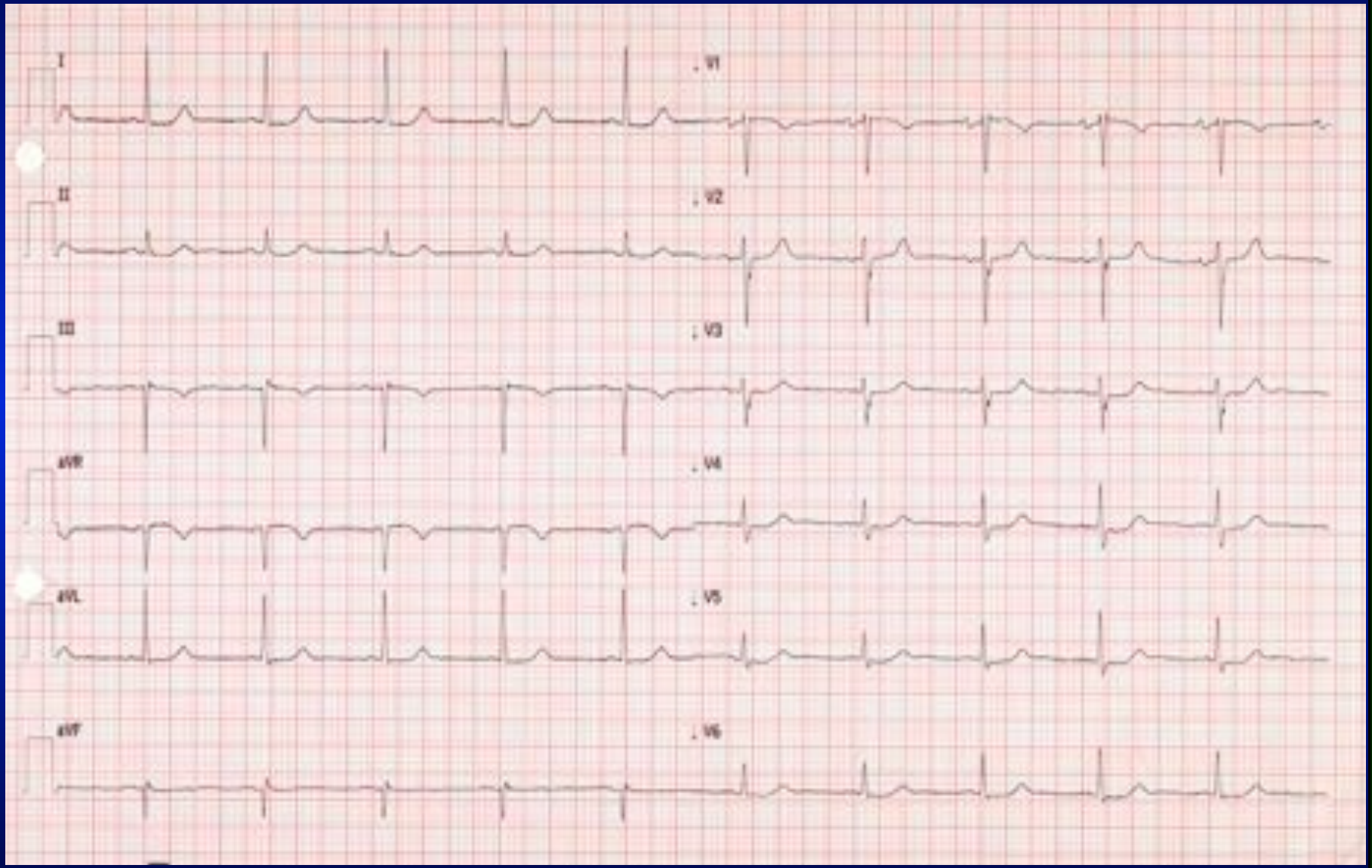






Voltage map

Follow up



4) CONCLUSIONS:

AF is less frequent than IART in GUCH

First we have to eliminate the circuits related to IART

AF ablation is feasible but require experienced centers

AF ablation results are less good and similar to NCSHD

The importance of patient selection


SR
3 rd
2 nd
1 st

It is convenient to intervene at an early stage

…before it's too late