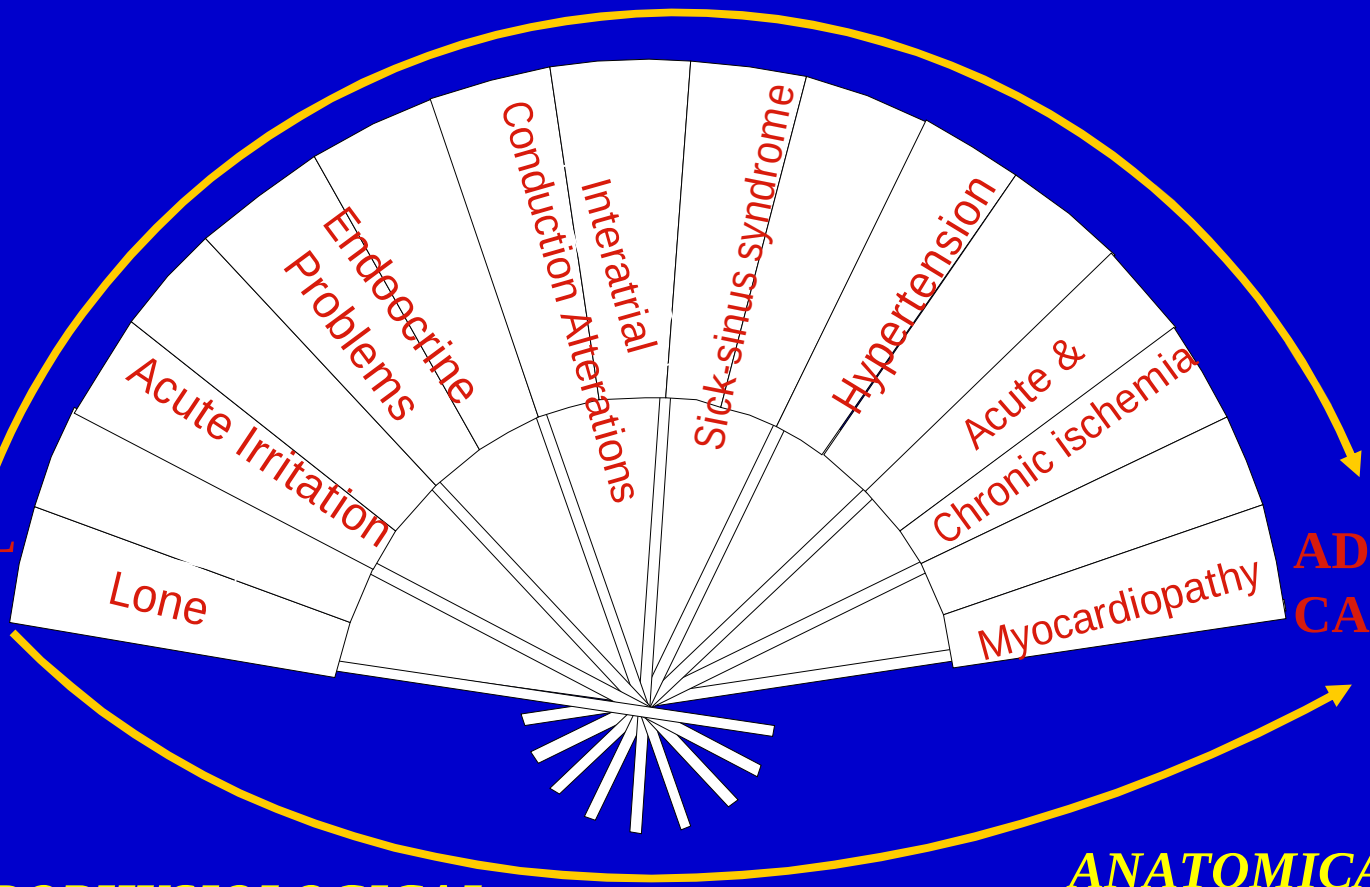
Fibrillazione atriale
Il trattamento

Claudio Pratola

Ferrara, 24/09/2011

Razionale: Eterogeneità



NORMAL HEART

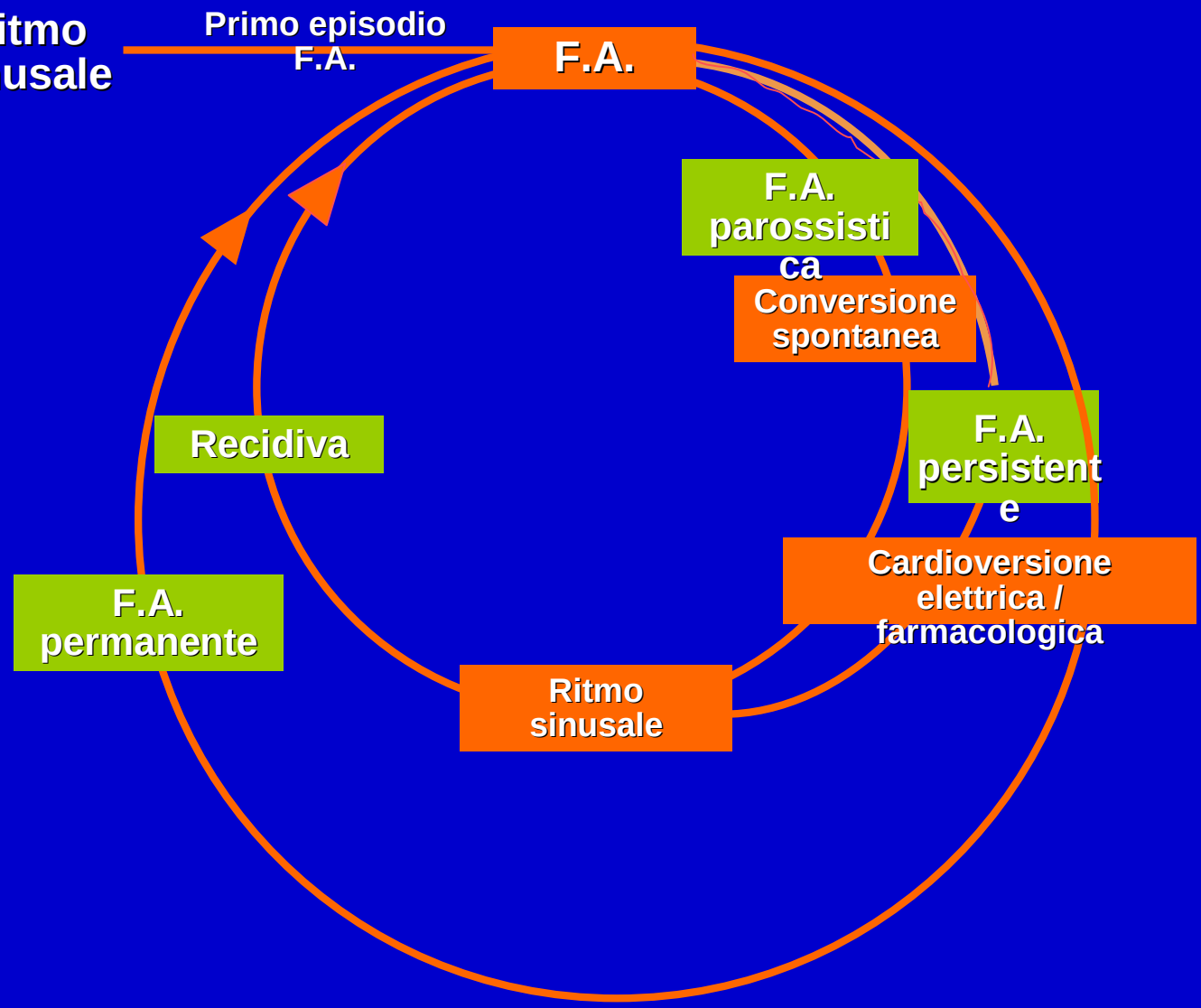
ADVANCED CARDIOPATHY

ELECTROPHYSIOLOGICAL SUBSTRATE

TRIGGERS

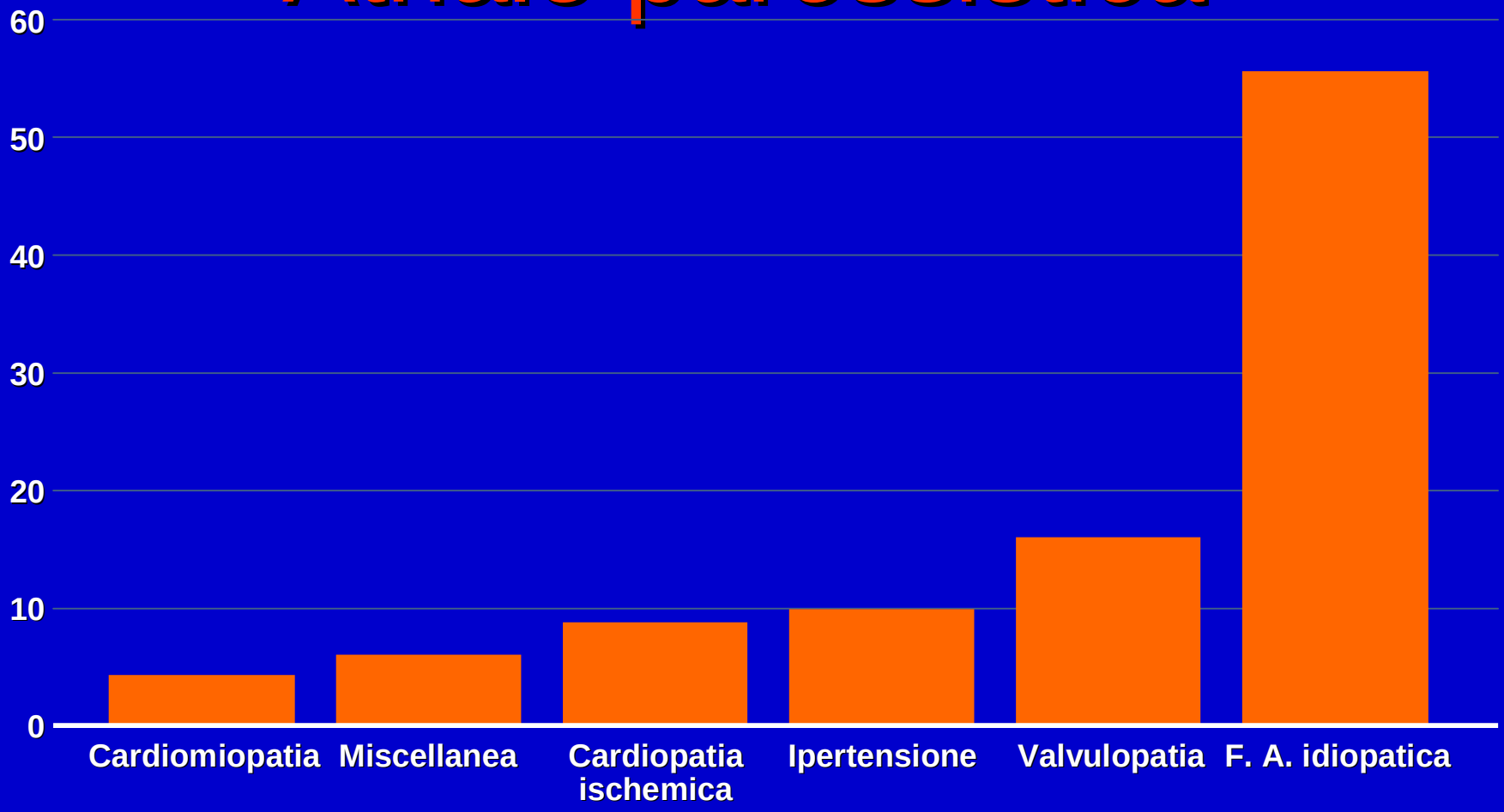
ANATOMICAL SUBSTRATE

Fibrillazione atriale



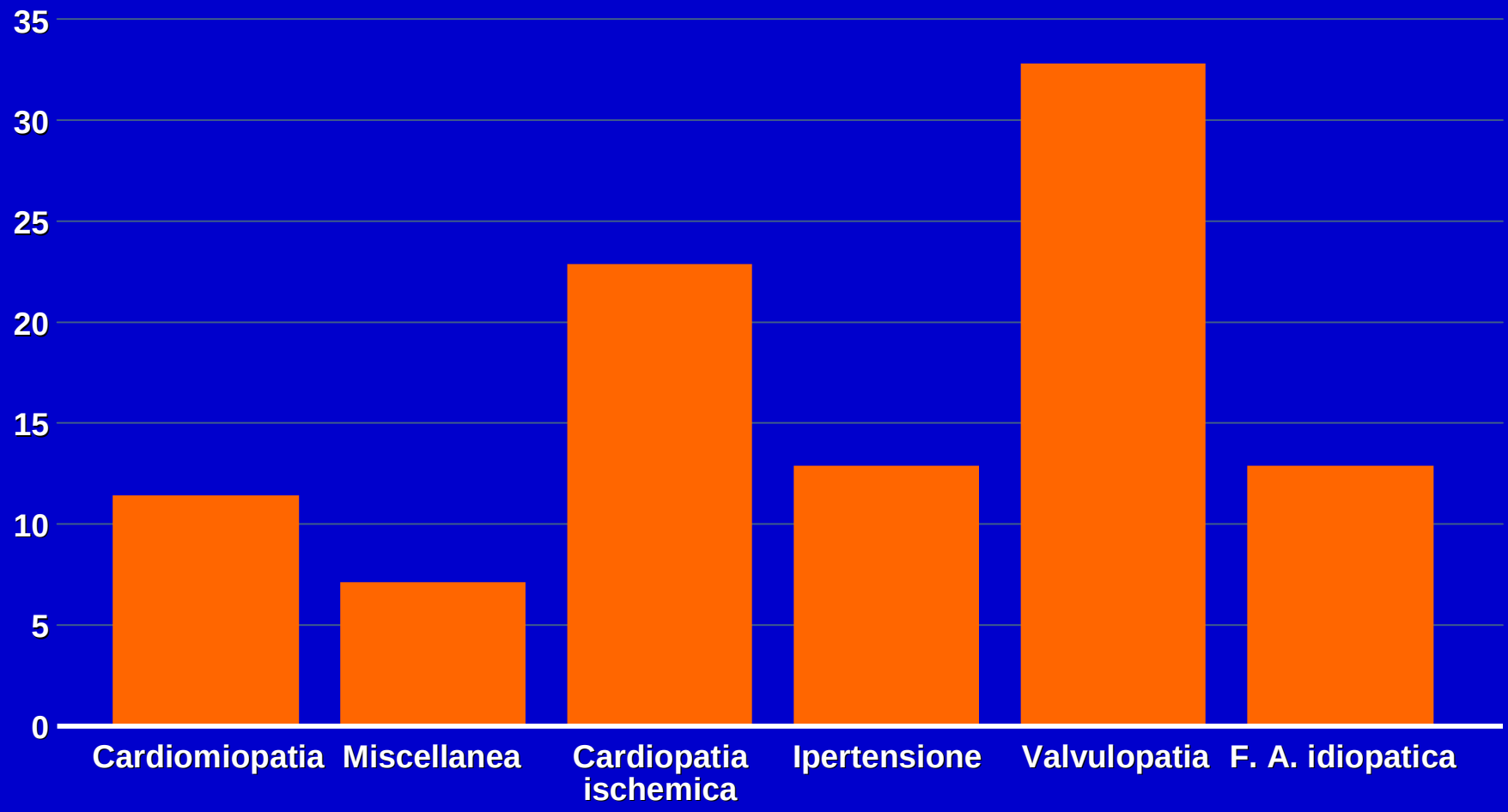
(Gallagher MM, Camm AJ. PACE 1996; 20: 1603-7)

Eziologia della Fibrillazione Atriale parossistica



(Camm AJ, Obel OA. AJC 1996; 78: 8A)

Eziologia della Fibrillazione Atriale cronica



(Camm AJ, Obel OA. AJC 1996; 78: 8A)

FA Recidivante nella popolazione generale in Italia (» 57 milioni)

40% di tutti i casi di Fibrillazione atriale

Prevalenza

114.000 – 228.000 casi

Incidenza a 1 anno

22.800 nuovi casi

FA Recidivante Refrattaria nella popolazione generale in Italia (» 57 milioni)

20% di tutti i casi di Fibrillazione atriale

Prevalenza

57.000 – 114.000 casi

Incidenza a 1 anno

11.400 nuovi casi

Punteggio di qualità di vita valutata mediante questionario SF-36

Item SF - 36	F.A. (n=152)	PTCA (n=69)	PTCA (n=78)	CHF (n=216)	Post-IMA (n=69)	Controlli* (n=47)
Stato di salute generale	54 ± 21	51 ± 23	65±22**	47 ± 24**	59 ± 19***	78 ± 17**
Funzione fisica	68 ± 27	60 ± 29	76±25***	48 ± 31**	70 ± 26	88 ± 19**
Ruolo fisico	47 ± 42	47 ± 45	71±39**	34 ± 40**	51 ± 39	89 ± 28**
Vitalità	47 ± 21	48 ± 26	60±20**	44 ± 24	58 ± 19**	71 ± 14**
Stato mentale	68 ± 18	74 ± 18	75±16**	75 ± 21**	76 ± 16**	81 ± 11**
Ruolo emozionale	65 ± 41	64 ± 44	83±35**	64 ± 43	73 ± 38	92 ± 25**
Funzionamento sociale	71 ± 28	74 ± 29	87±21**	71 ± 33	85 ± 21**	92 ± 14**
Dolore corporeo	69 ± 19	68 ± 17	73±27	63 ± 31***	73 ± 25	77 ± 15***

* p <0,05 vs pazienti con F.A.

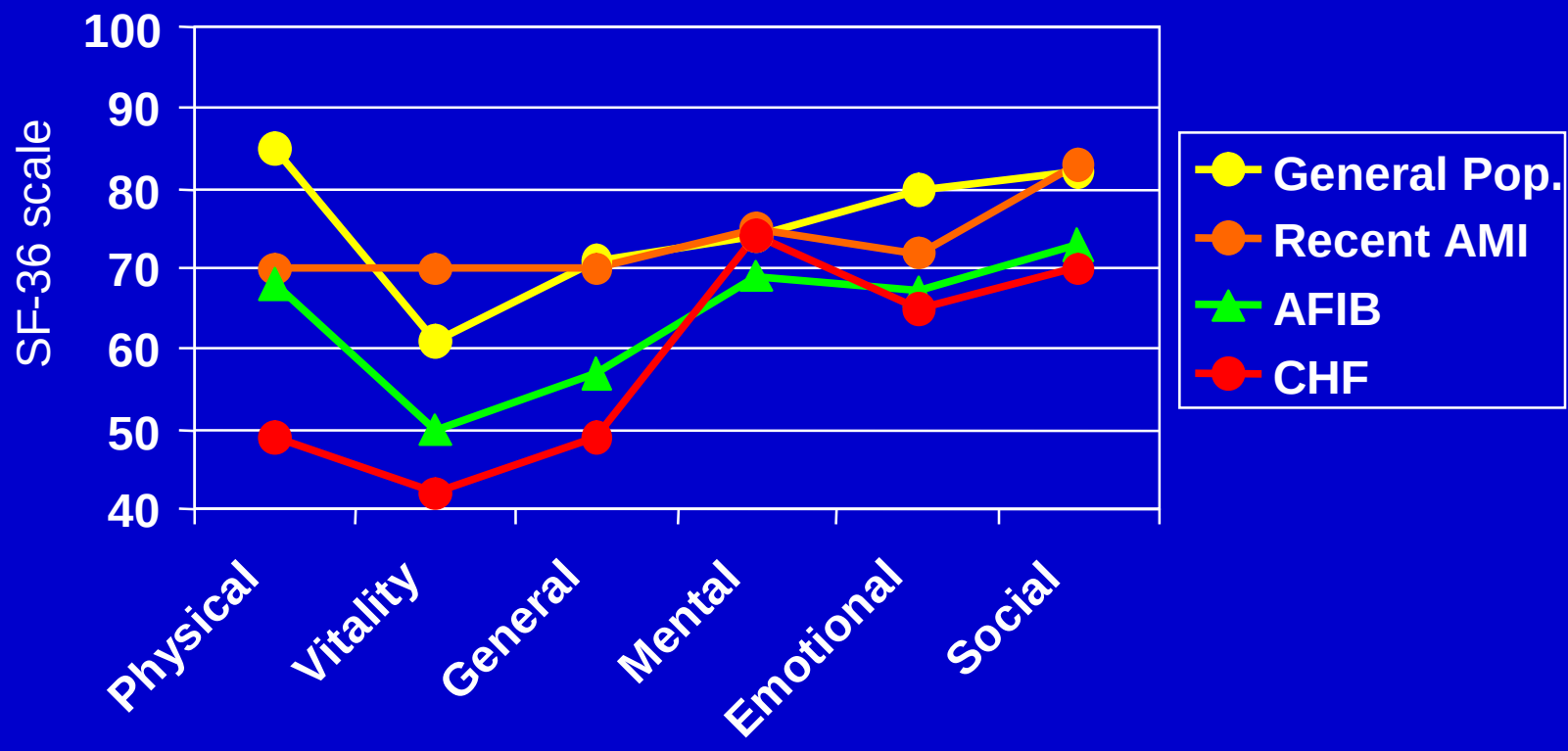
** p <0,001 vs pazienti con F.A.

*** Tutti i valori rappresentano i punteggi medi ± 5D; i punteggi più elevati indicano una miglior qualità di vita

F.A. = Fibrillazione Atriale; PTCA = angioplastica coronarica percutanea transluminale; i pazienti sottoposti a PTCA provenivano da 2 differenti centri; CHF = scompenso cardiaco; Post-IMA =post-infarto miocardico

(Dorian P et al. JACC 2000; 36: 1303-9)

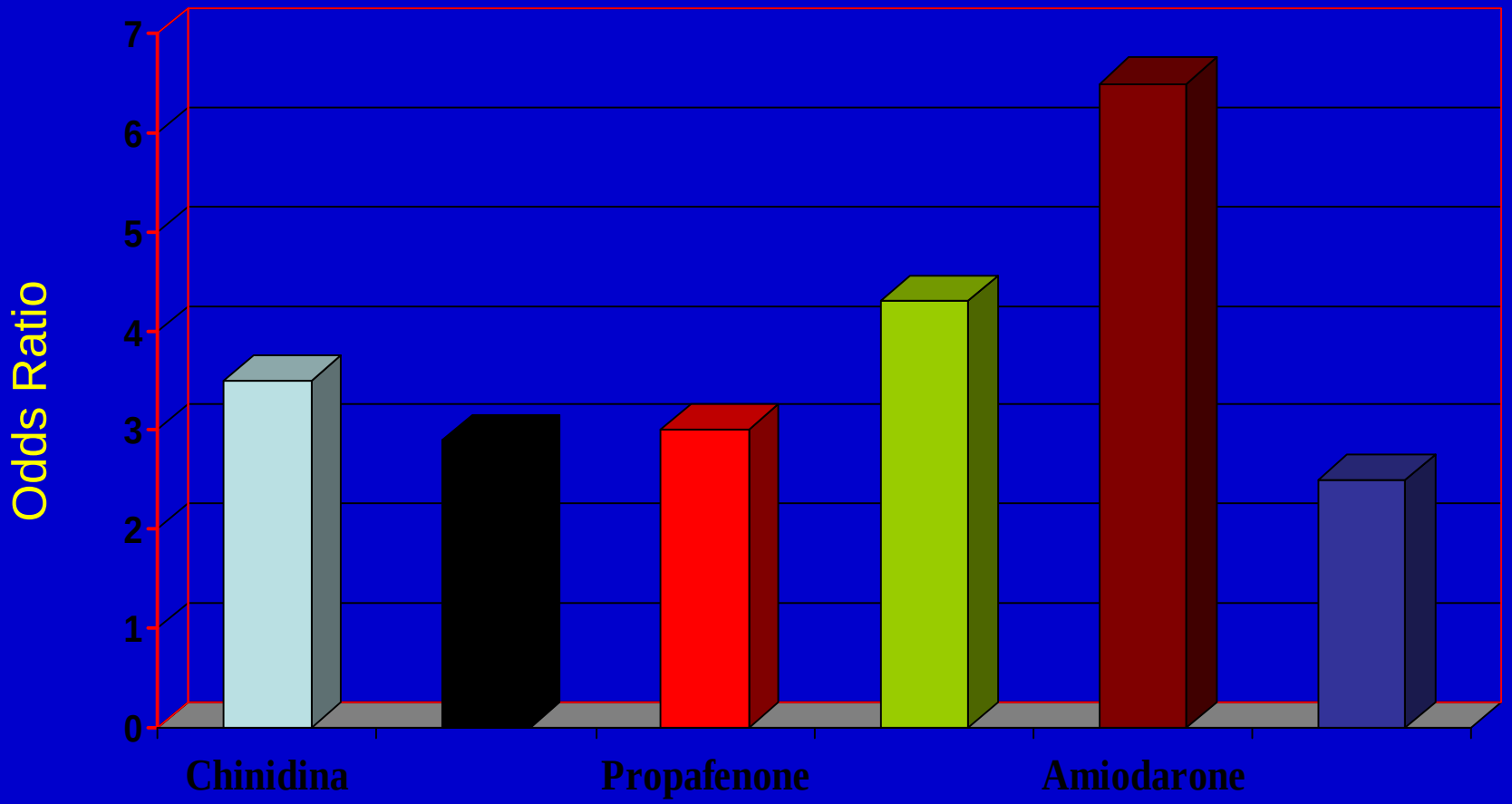
Qualità di vita dei pazienti in fibrillazione atriale



Jung W *JACC* 33:104A; 1999

Farmaci antiaritmici per il mantenimento del RS in Paz. con FA

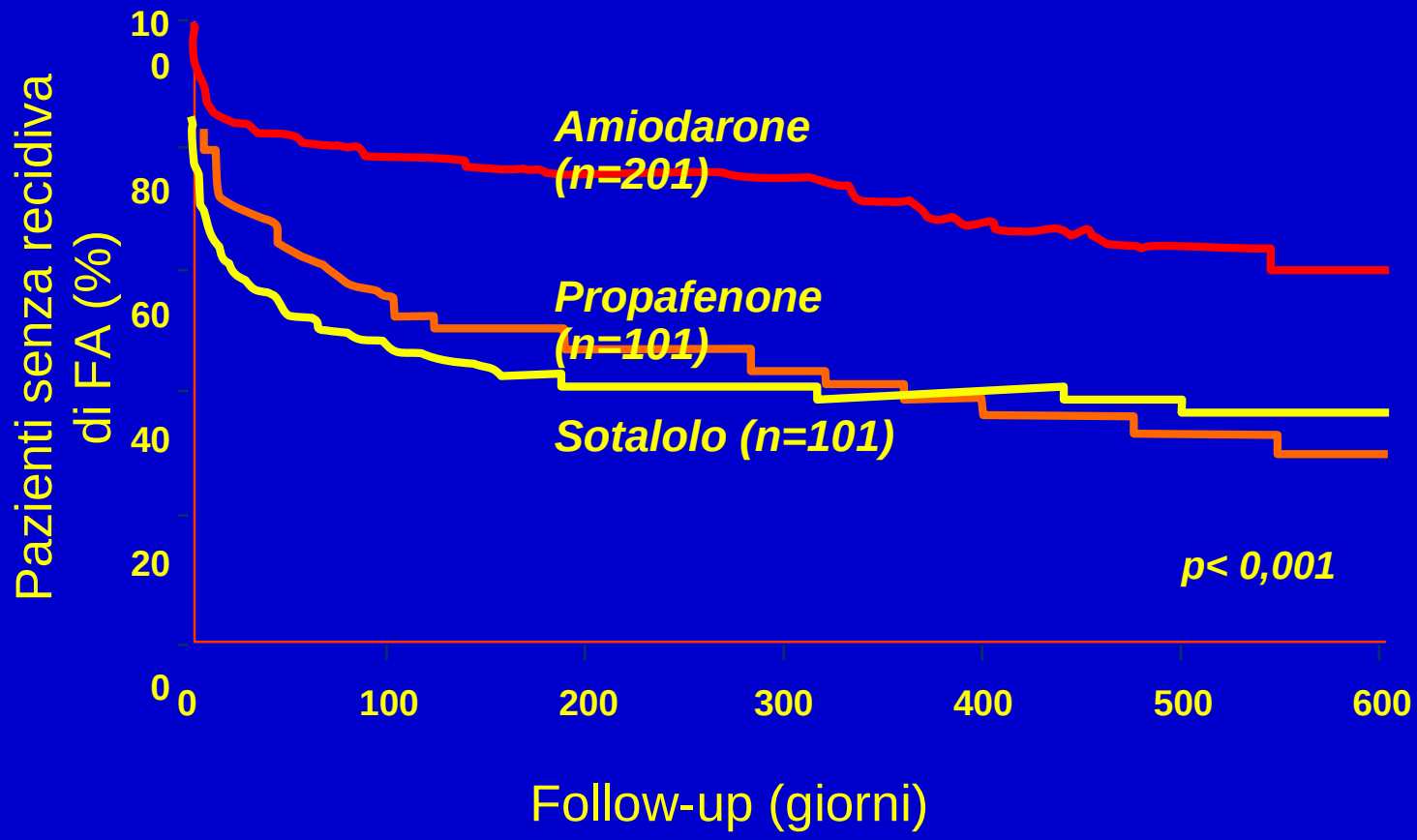
Metanalisi di 18 trials randomizzati e controllati



Amio > rischio di effetti collaterali non-cardiaci

Tamariz L. J Am Coll Cardiol 2003: 536 A

Fibrillazione Atriale
Profilassi delle Recidive:
Amiodarone vs Propafenone vs Sotalolo



Roy D. NEJM 342: 913; 2000

CONTROLLO DEL RITMO

↓

Farmaci antiaritmici + Cardioversione

o

CONTROLLO DELLA FREQUENZA

↓

Farmaci che rallentano la conduzione nel nodo A-V

CONTROLLO DEL RITMO VS CONTROLLO DELLA FREQUENZA

- **PIAF, Lancet 2000**
- **RACE, N Engl J Med 2002**
- **AFFIRM, N Engl J Med 2002**
- **AF-CHF JACC 2010**

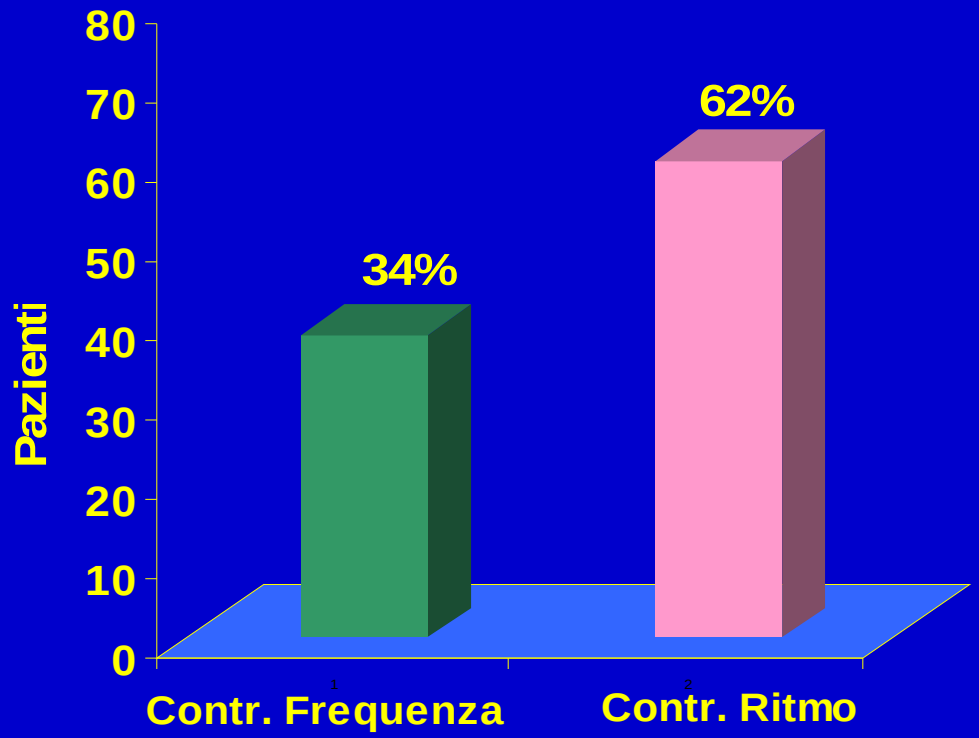
Studio AFFIRM

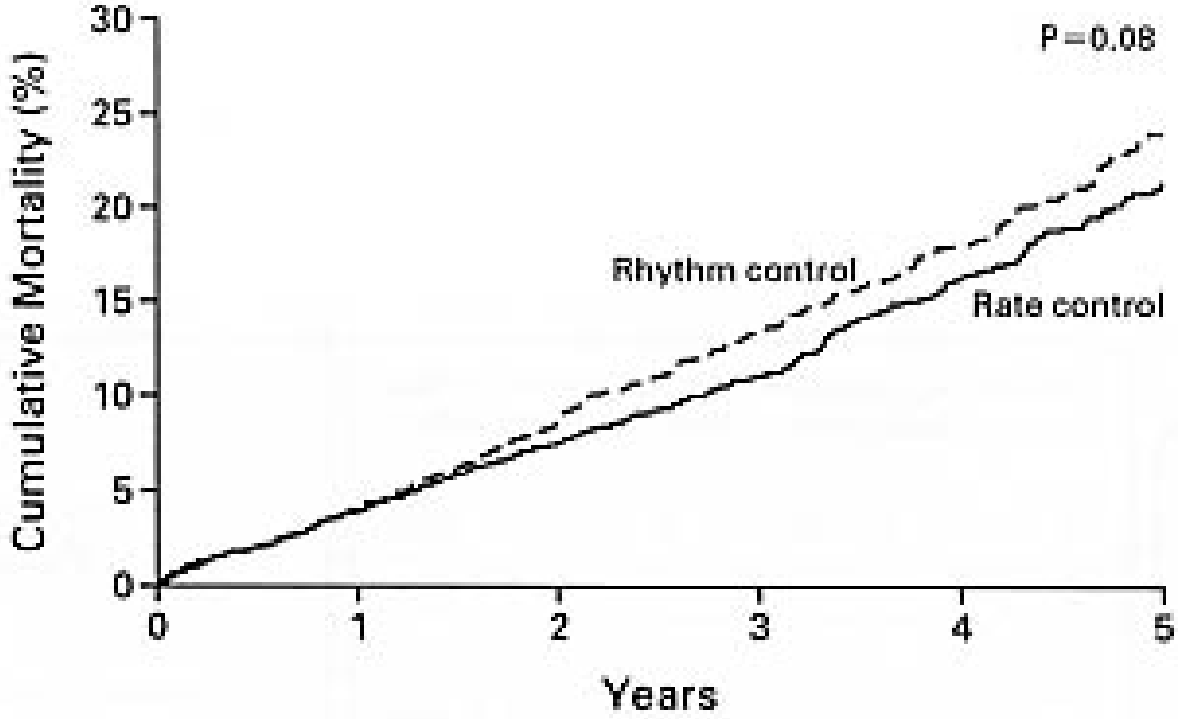
Terapia iniziale

CONTROLLO DELLA FREQUENZA	CONTROLLO DEL RITMO
Digossina: 49%	Amiodarone: 38%
Betabloccanti: 47%	Sotalolo: 31%
Calcioantagonisti: 40%	Propafenone: 9%

AFFIRM STUDY

Ritmo sinusale a 5 anni





No. of Deaths		number (percent)				
Rhythm control	0	80 (4)	175 (9)	257 (13)	314 (18)	352 (24)
Rate control	0	78 (4)	148 (7)	210 (11)	275 (16)	306 (21)

Figure 1. Cumulative Mortality from Any Cause in the Rhythm-Control Group and the Rate-Control Group.

Time zero is the day of randomization. Data have been truncated at five years.

Studio AFFIRM

I risultati dimostrano che nei pazienti con FA a rischio di eventi tromboembolici una terapia finalizzata a controllare la frequenza cardiaca non è inferiore ad una finalizzata a mantenere il ritmo sinusale.

AF-CHF

Journal of the American College of Ca
© 2010 by the American College of C
Published by Elsevier Inc.

Vol. 55, No. 17, 2010
ISSN 0735-1097/10/$36.00
doi:10.1016/j.jacc.2010.01.023

QUARTERLY FOCUS IS

Maintenance
With Heart F

Patients

Mario Talajic, MD,*
Paul Dorian, MD,‡ I
Kerry L. Lee, PHD,‖
Lynne Warner Steve
D. George Wyse, M

. Connolly, MD,†
nloser, MD,§
sen, MD,¶
D,**

Montreal, Quebec, Ha
Durham, North Carol

Frankfurt, Germany;
land, Ohio

Objectives Tl
pi

Background Tl

Methods A
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Results O
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Conclusions A
w
Fi

f sinus rhythm and outcomes in
F).

F) is uncertain.

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es.

e rhythm-control strategy was not
interval [CI]: 0.70 to 1.16; p =
HF (HR: 0.86, 95% CI: 0.68 to
sinus rhythm was not associated
mortality [HR: 1.11, 95% CI: 0.78
9).

ith better outcomes in patients
rican College of Cardiology

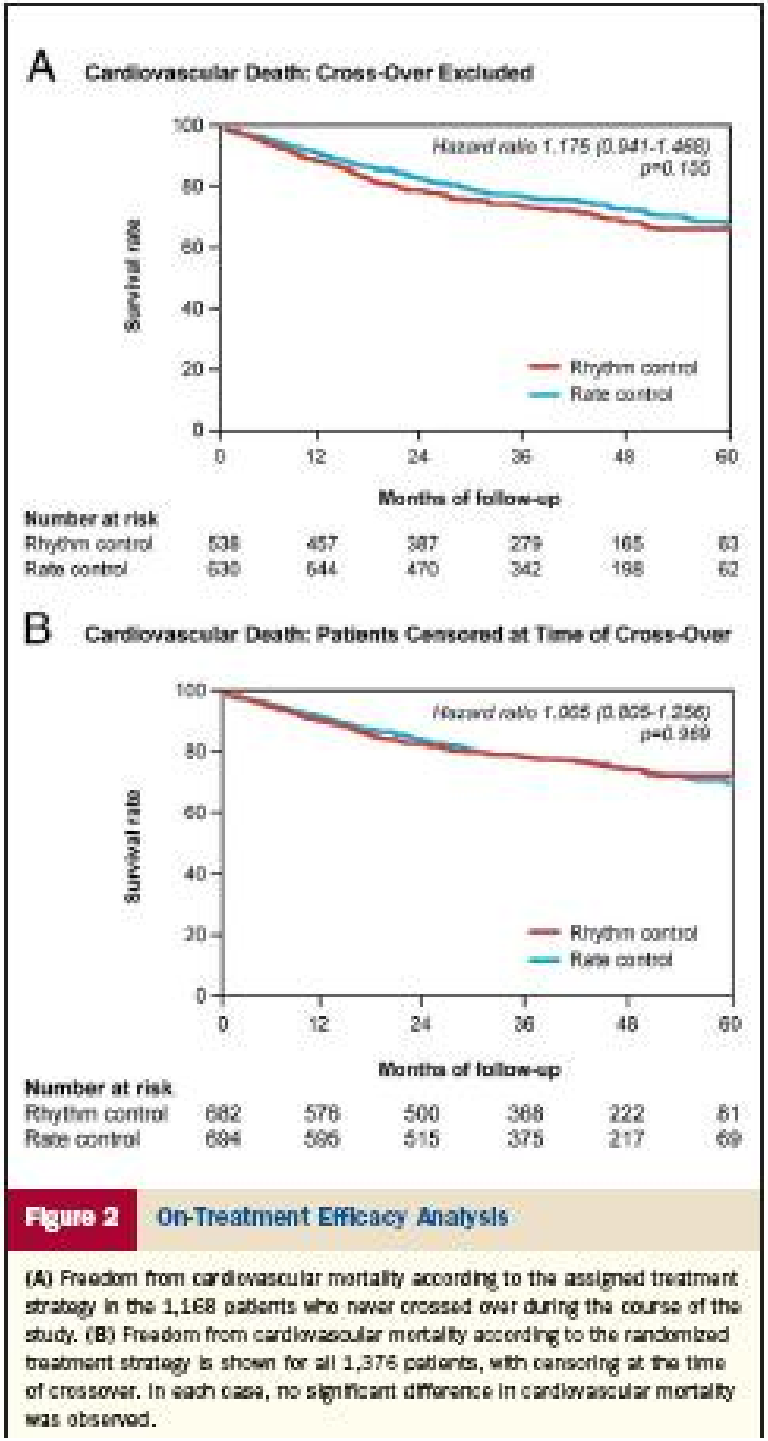


Figure 2 On-Treatment Efficacy Analysis

(A) Freedom from cardiovascular mortality according to the assigned treatment strategy in the 1,168 patients who never crossed over during the course of the study. (B) Freedom from cardiovascular mortality according to the randomized treatment strategy is shown for all 1,376 patients, with censoring at the time of crossover. In each case, no significant difference in cardiovascular mortality was observed.

Relationships Between Sinus Rhythm, Treatment, and Survival ... igation of

The association of SR but not AADs with improved survival may reflect the fact that currently available AADs are neither highly efficacious nor completely safe. One could

Implications

In patients with AF such as those enrolled in the AFFIRM Study, warfarin use improves survival. The presence of SR but not AAD use is associated with a lower risk of death. These results suggest that if an effective method for maintaining SR with fewer adverse effects were available, it might improve survival.

AFFIRM revisited...

Background death wit analysis. as they cl

Methods an variables, increased ischemic the prese (AADs) original intent model.

Conclusions—W factors associ available AA AADs are off available, it m

...or stroke or ...ion-to-treat ...d treatment

...ine clinical ...ed with an ...or transient ...t variables, ...hmic drugs ...nt with the ...removed from the

...a marker for other ...model. Currently ...rhythmic effects of ...lverse effects were

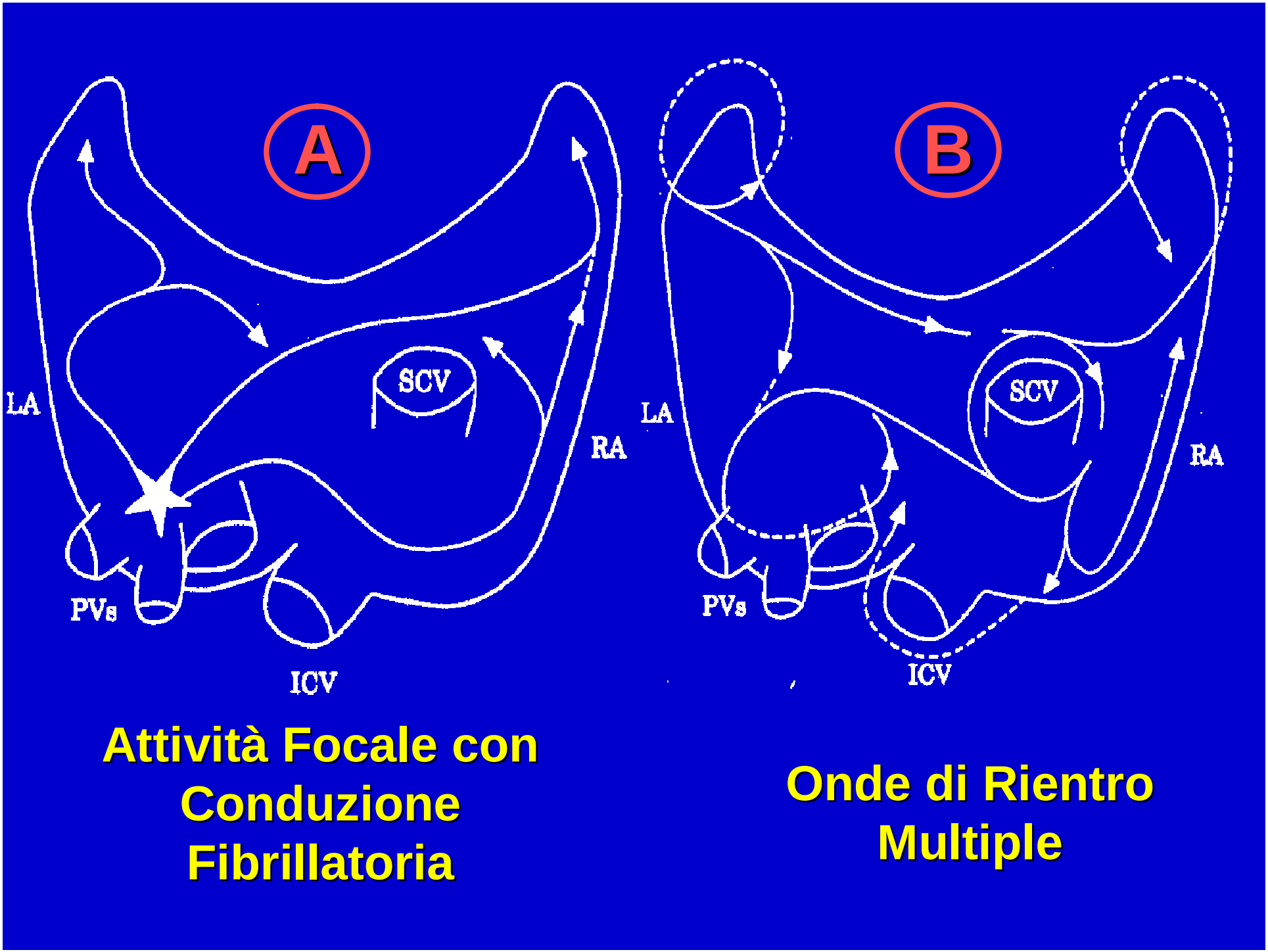
...demographics were different from those in the AFFIRM Study. Most importantly, a requirement for high risk for stroke or death was not an entry criterion. Like our findings, these data require confirmation by ... trolled clinical trials.

AFFIRM revisited...

Key Words: antiarrhythmia agents ■ anticoagulants ■ arrhythmia ■ fibrillation

Ablazione della fibrillazione atriale

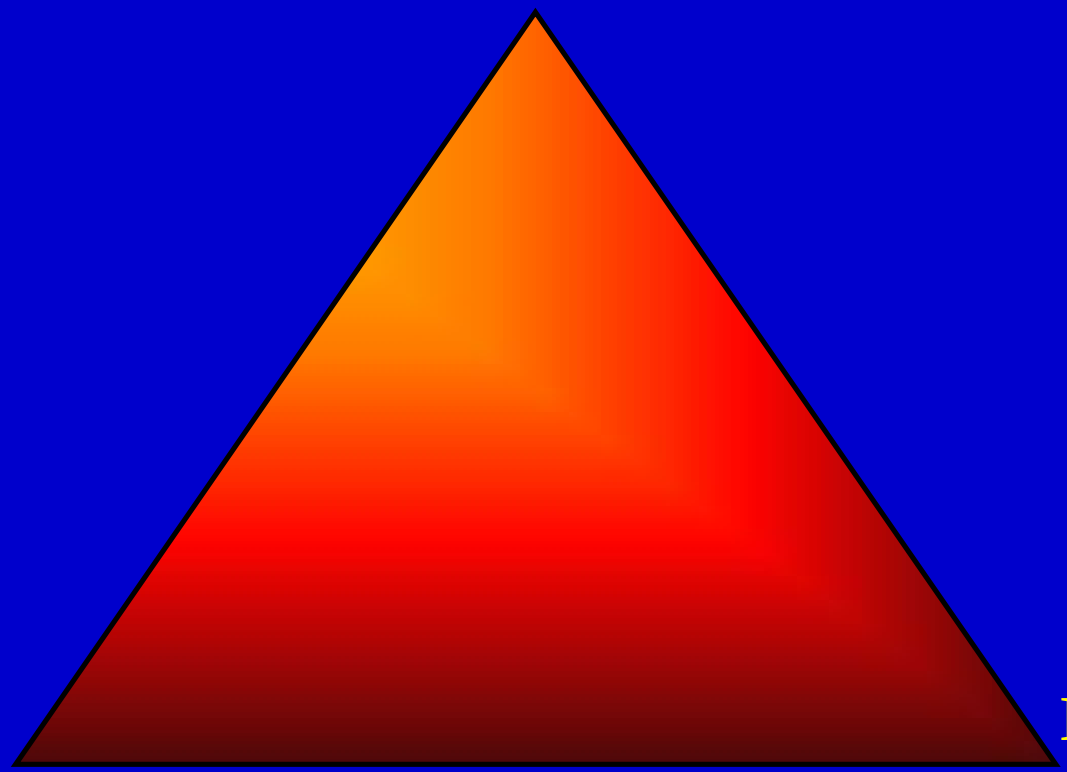
Questa sconosciuta

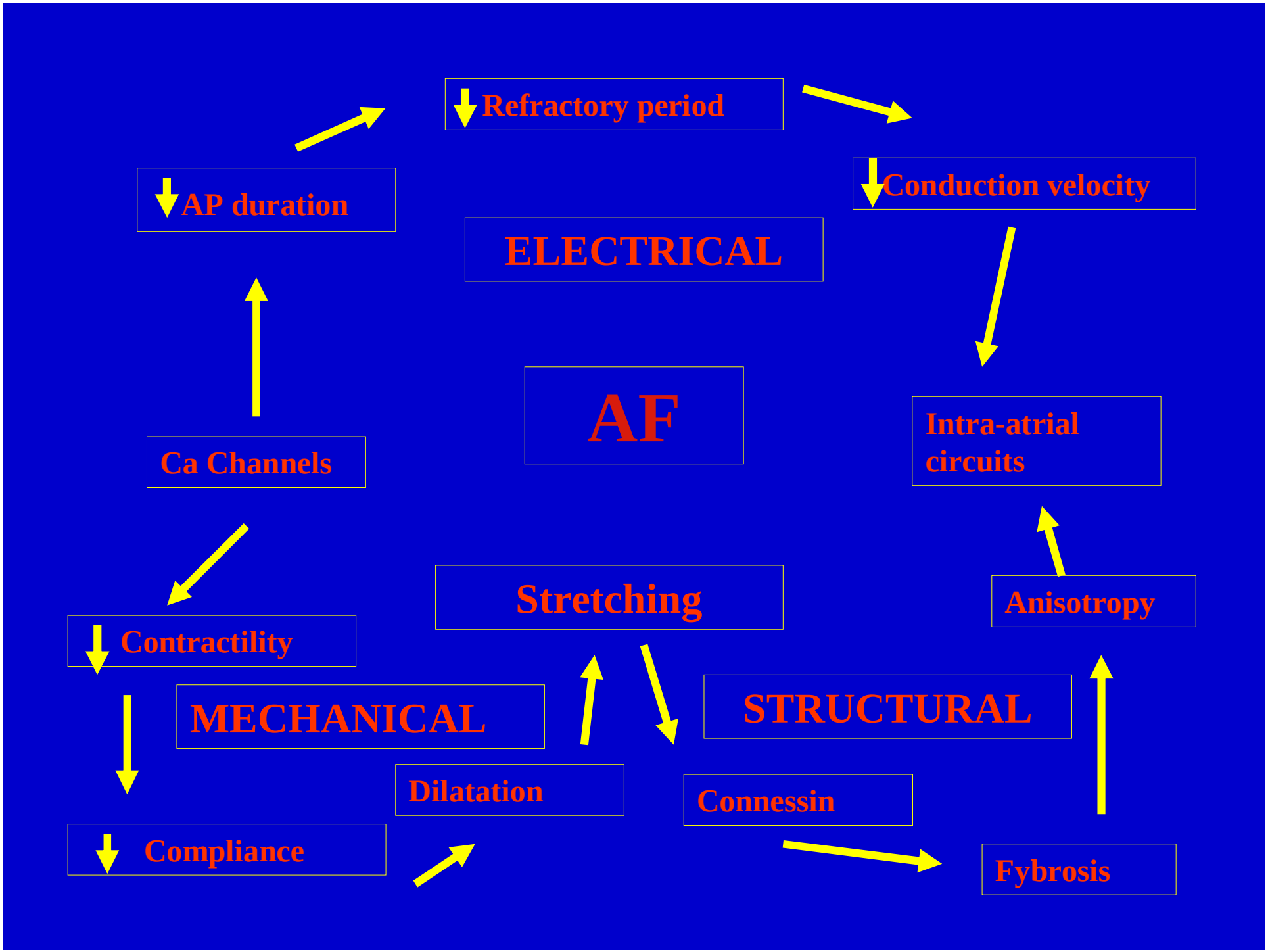


Attività Focale con Conduzione Fibrillatoria

Onde di Rientro Multiple

AF: pathophysiology

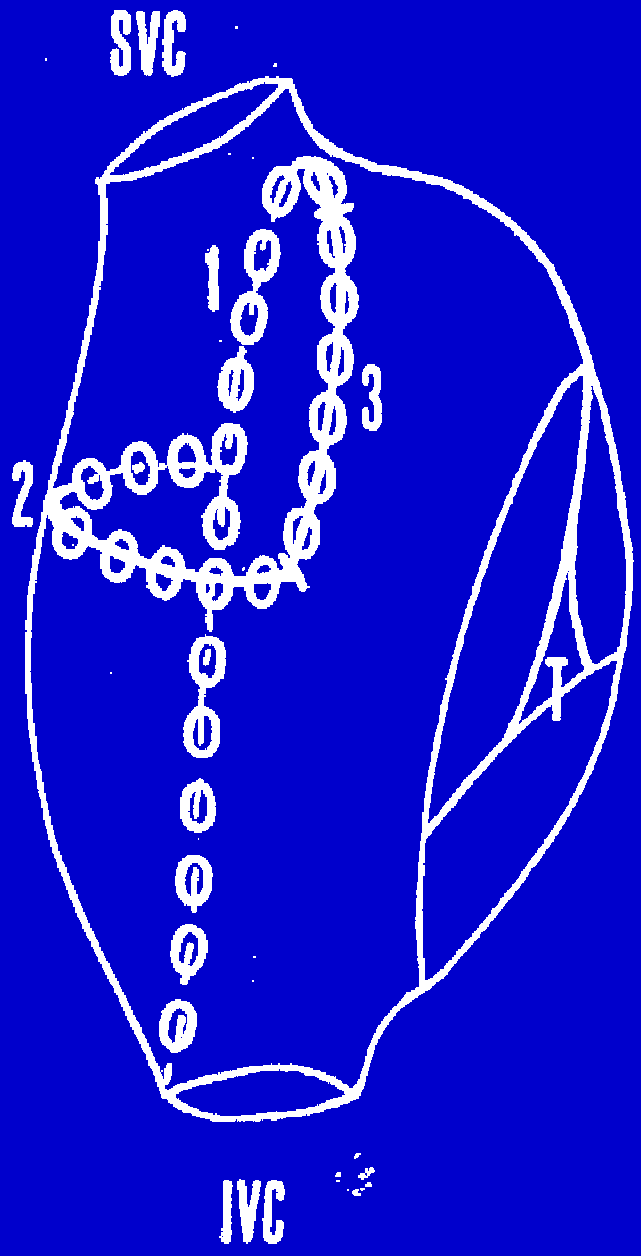



Refractory period
Conduction velocity
AP duration
ELECTRICAL
AF
Intra-atrial circuits
Ca Channels
Stretching
Anisotropy
Contractility
MECHANICAL
STRUCTURAL
Dilatation
Connessin
Compliance
Fybrosis

Successful Catheter Ablation of Atrial Fibrillation

MICHEL HAÏSSAGUERRE, M.D., LAURENT GENCEL, M.D.,
BRUNO FISCHER, M.D., PHILIPPE LE MÉTAYER, M.D., FRANCK POQUET, M.D.,
FRANK I. MARCUS, M.D.,* and JACQUES CLÉMENTY, M.D.

J Cardiovasc Electrophysiol 1994;5:1045-1052



Atrio Destro

Haïssaguerre M et al. J Cardiovasc Electrophysiol 1994;5:1045-1052

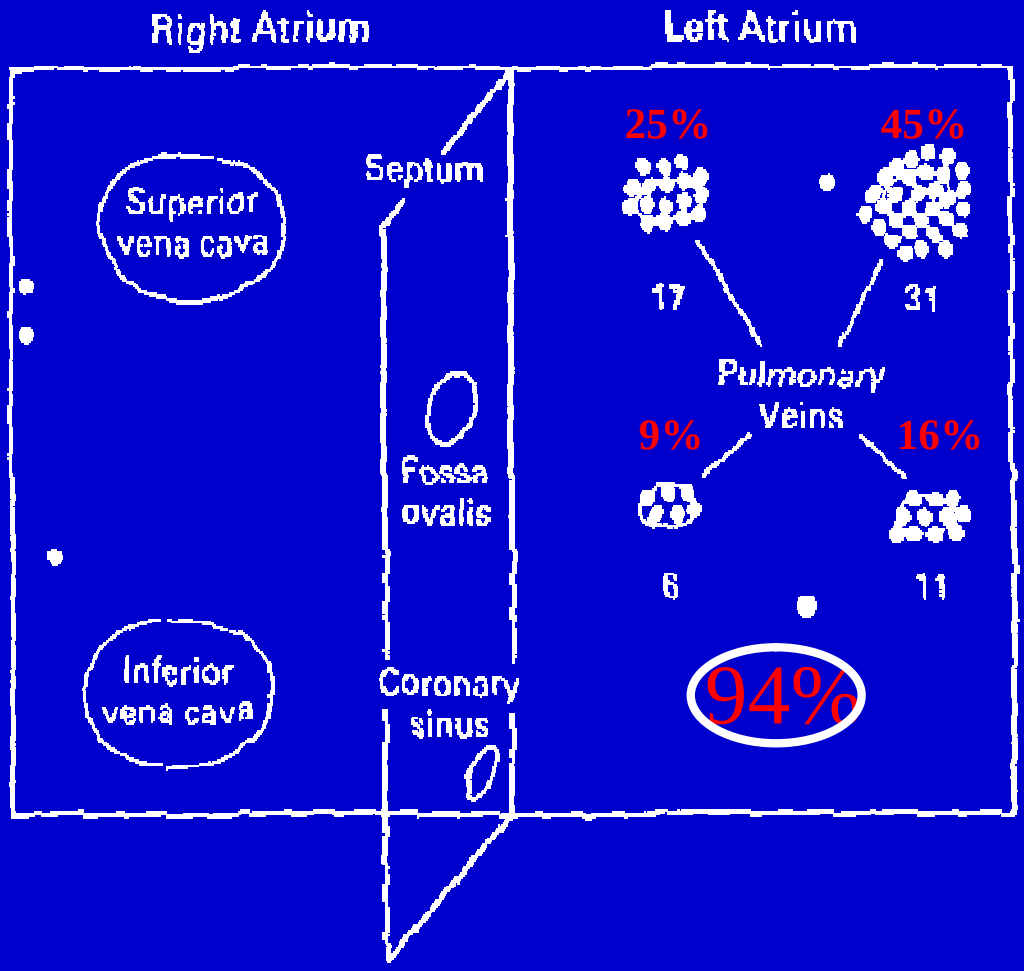
SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

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.

N Engl J Med; 1998: 339; 659-66

Foci Triggering Atrial Fibrillation

45 Pz
con
FA paross.
refrattaria



Foci

1 : 29 (64%)

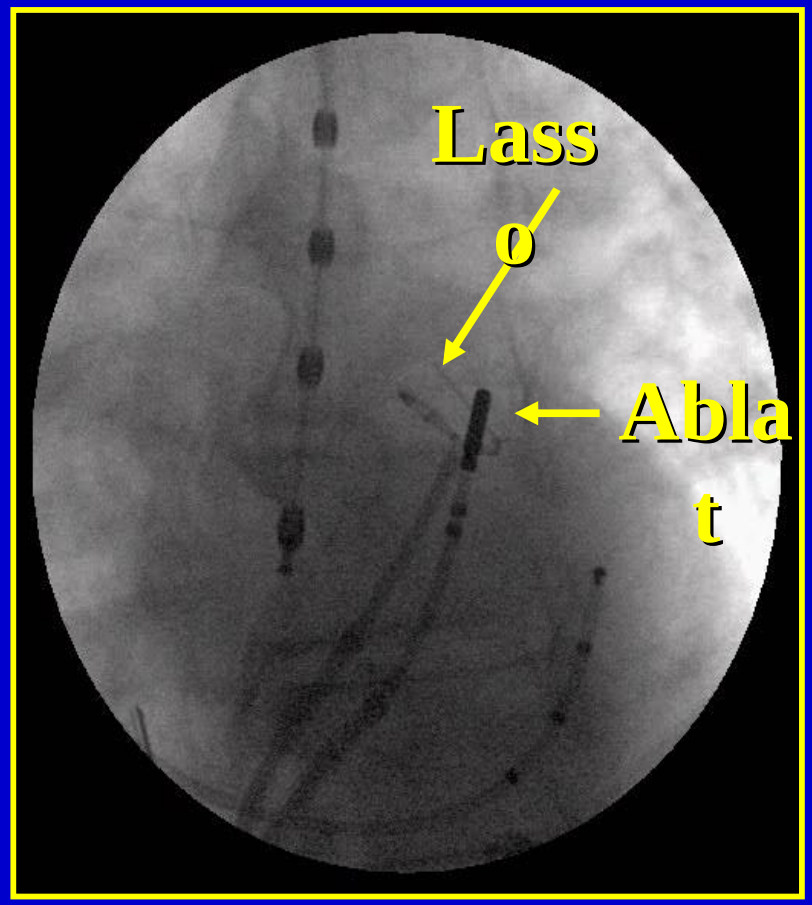
2 : 9 (20%)

3-4 : 7 (16%)

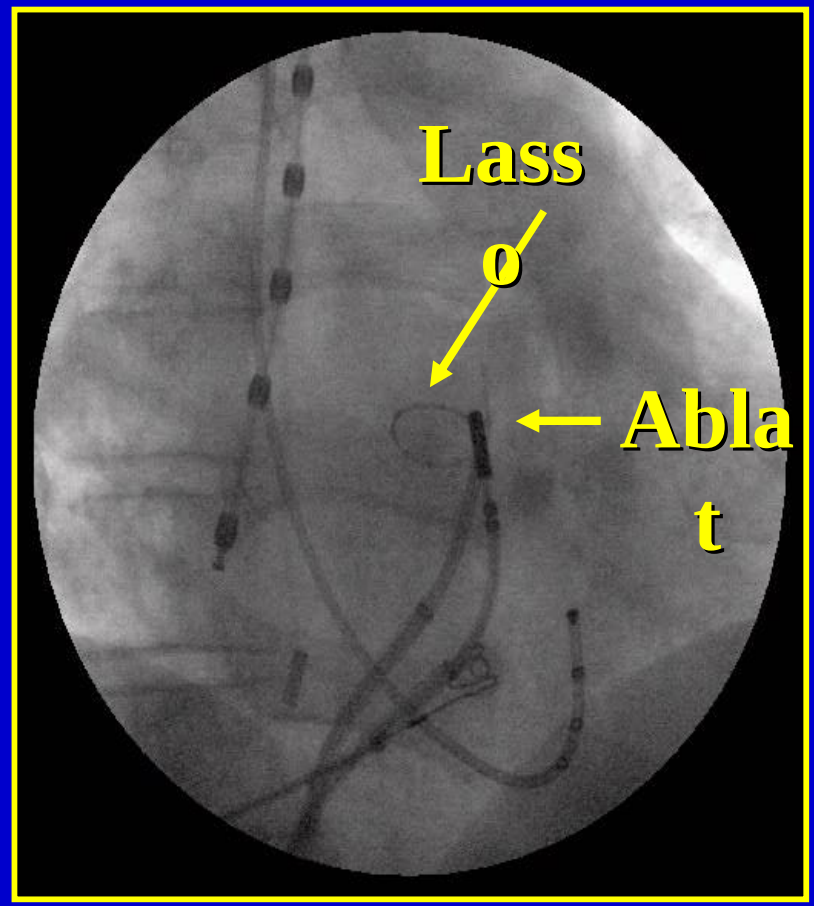
Follow-up (8 ± 6 mesi) 62% assenza di recidive di FA

Haïssaguerre M et al. NEJM 1998; 339: 659-66

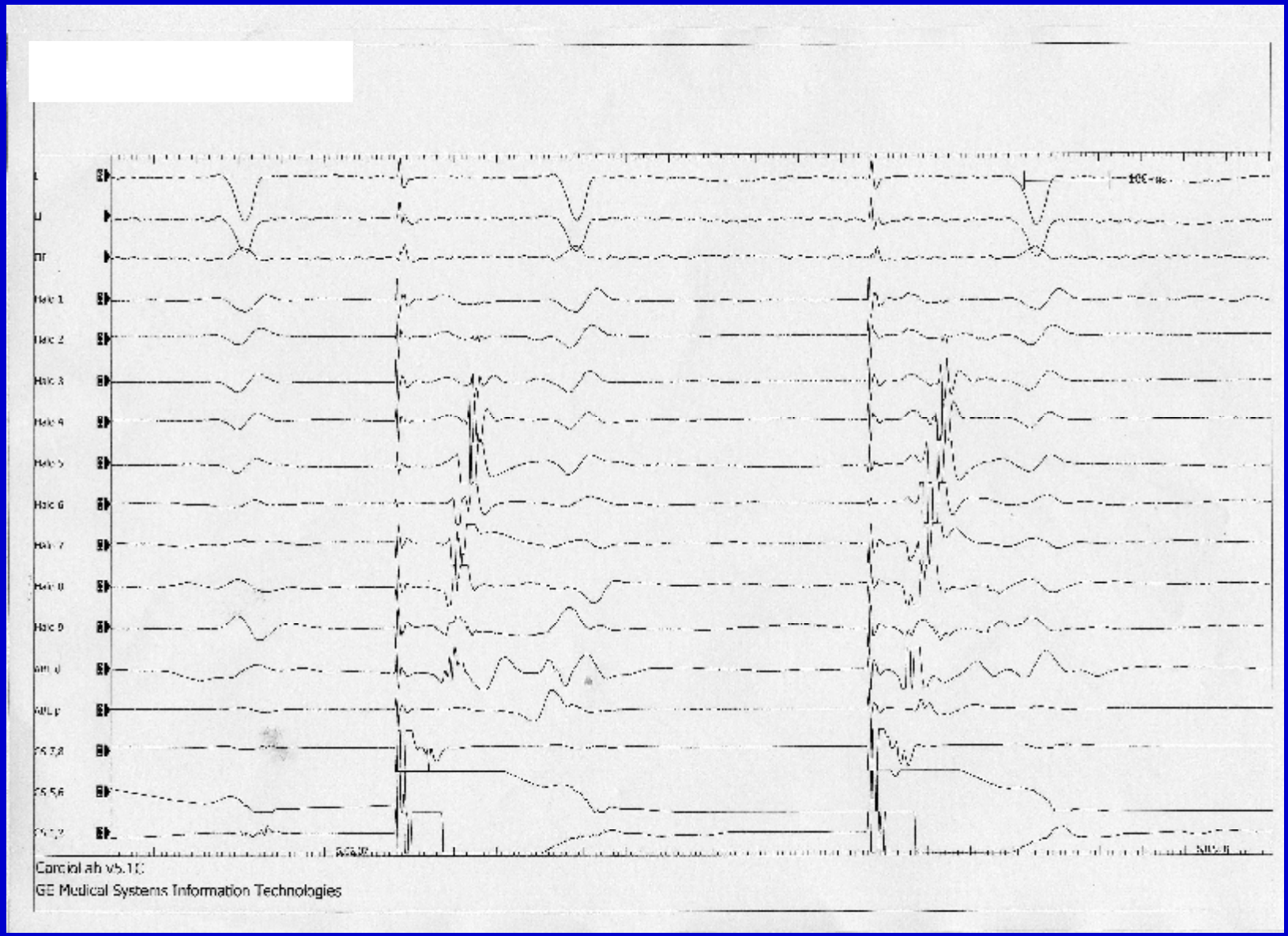
PV-LA Junction Disconnection

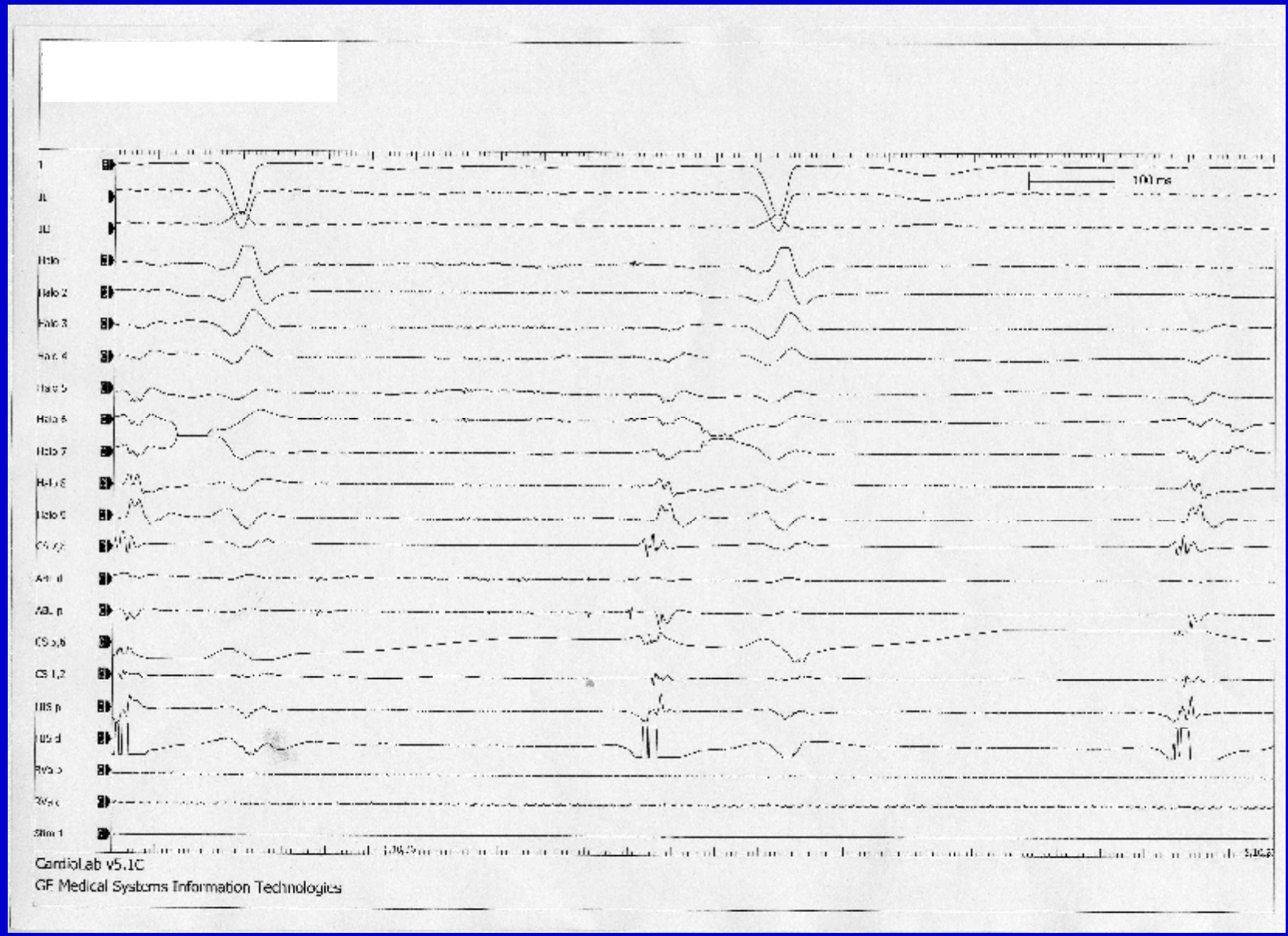


LAO

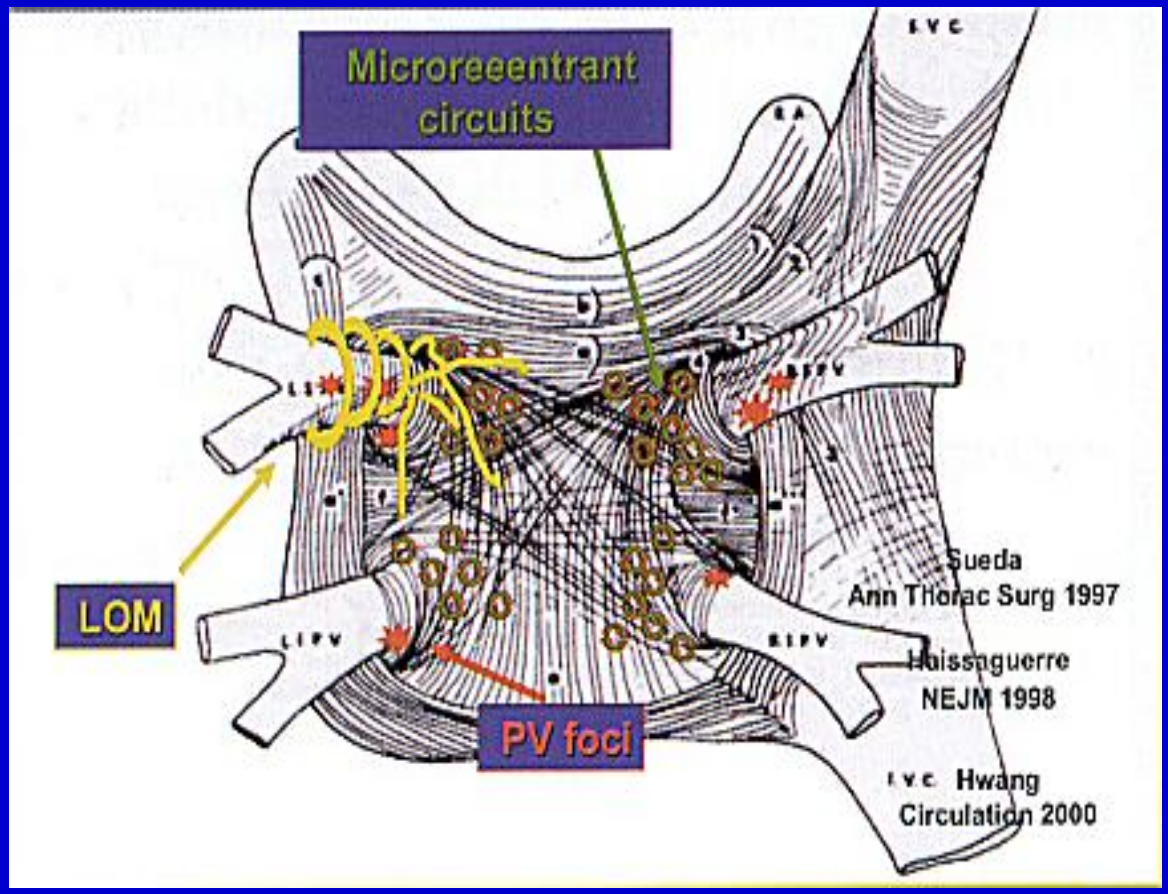


RAO


Cardiolab v5.1C
GE Medical Systems Information Technologies


100 ms
CardioLab v5.1C
GE Medical Systems Information Technologies

Substrato elettrico della fibrillazione atriale



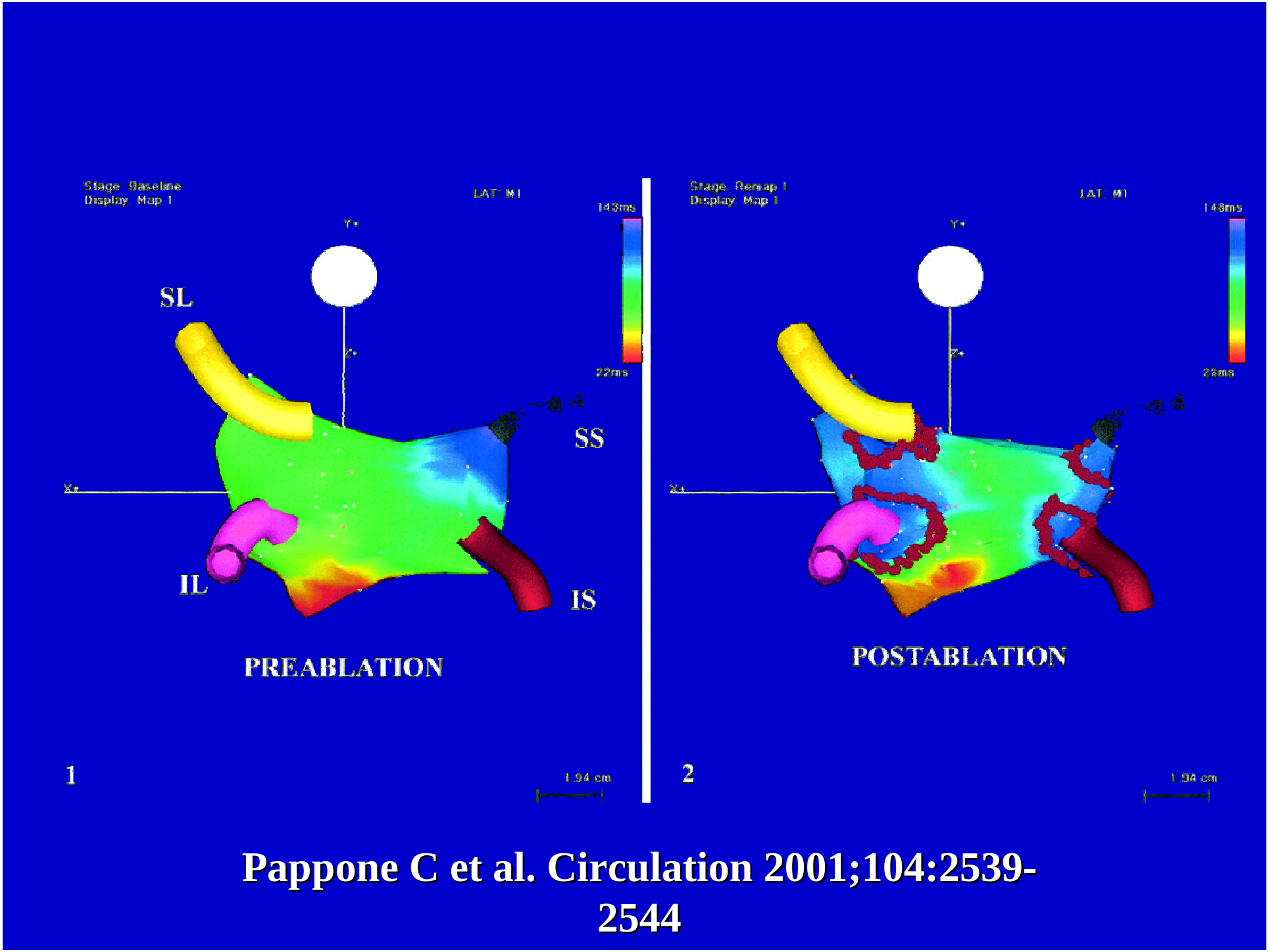
A livello della giunzione tra atrio sinistro e vene polmonari è presente una zona critica, la quale contiene stabili circuiti di rientro, ospita foci che inducono la FA e contiene terminazioni nervose del SNA.

Circumferential Radiofrequency Ablation of Pulmonary Vein Ostia

A New Anatomic Approach for Curing Atrial Fibrillation

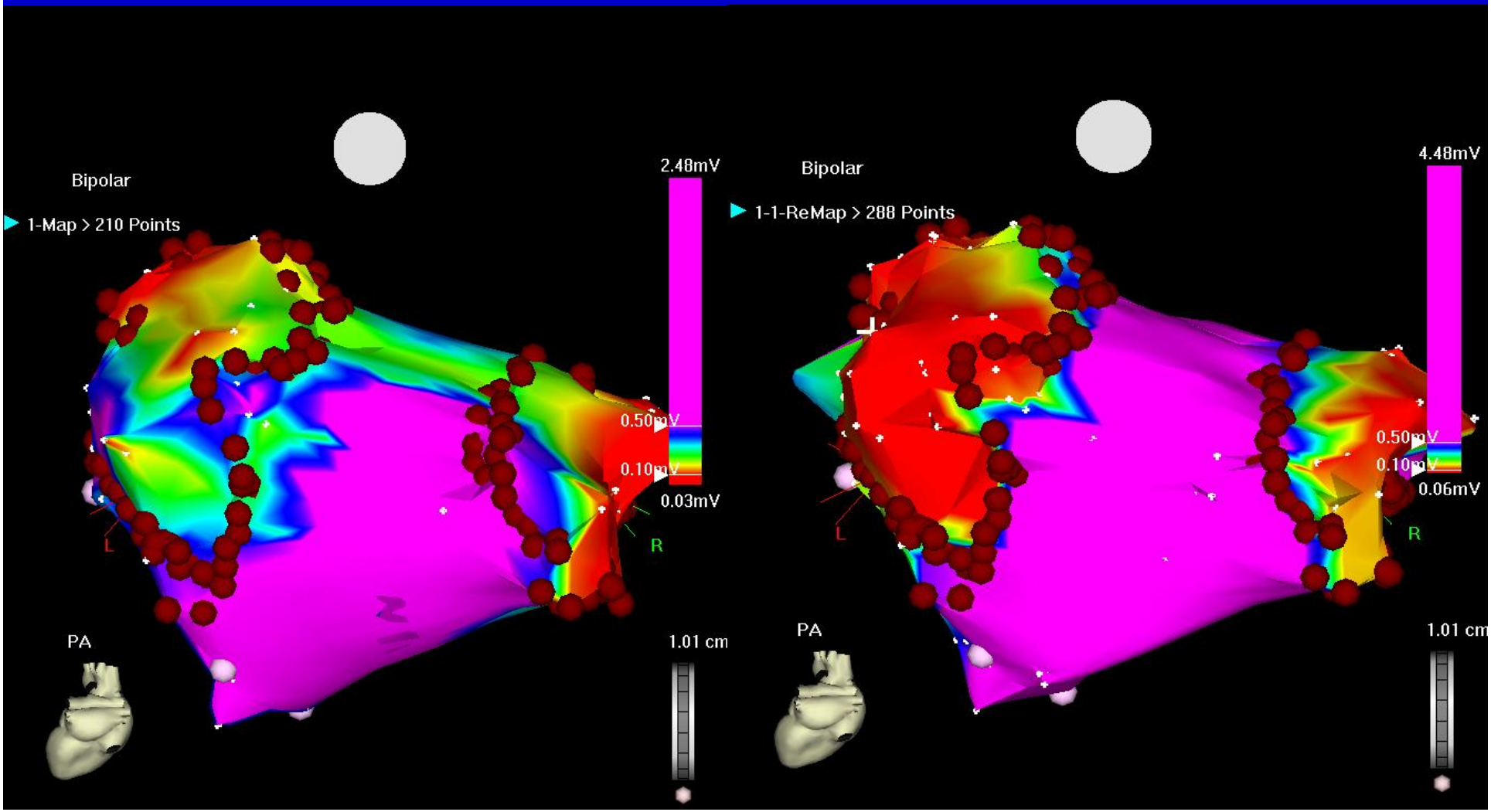
Carlo Pappone, MD, PhD; Salvatore Rosanio, MD, PhD; Giuseppe Oreto, MD; Monica Tocchi, MD; Filippo Gugliotta, BS; Gabriele Vicedomini, MD; Adriano Salvati, MD; Cosimo Dicandia, MD; Patrizio Mazzone, MD; Vincenzo Santinelli, MD; Simone Gulletta, MD; Sergio Chierchia, MD

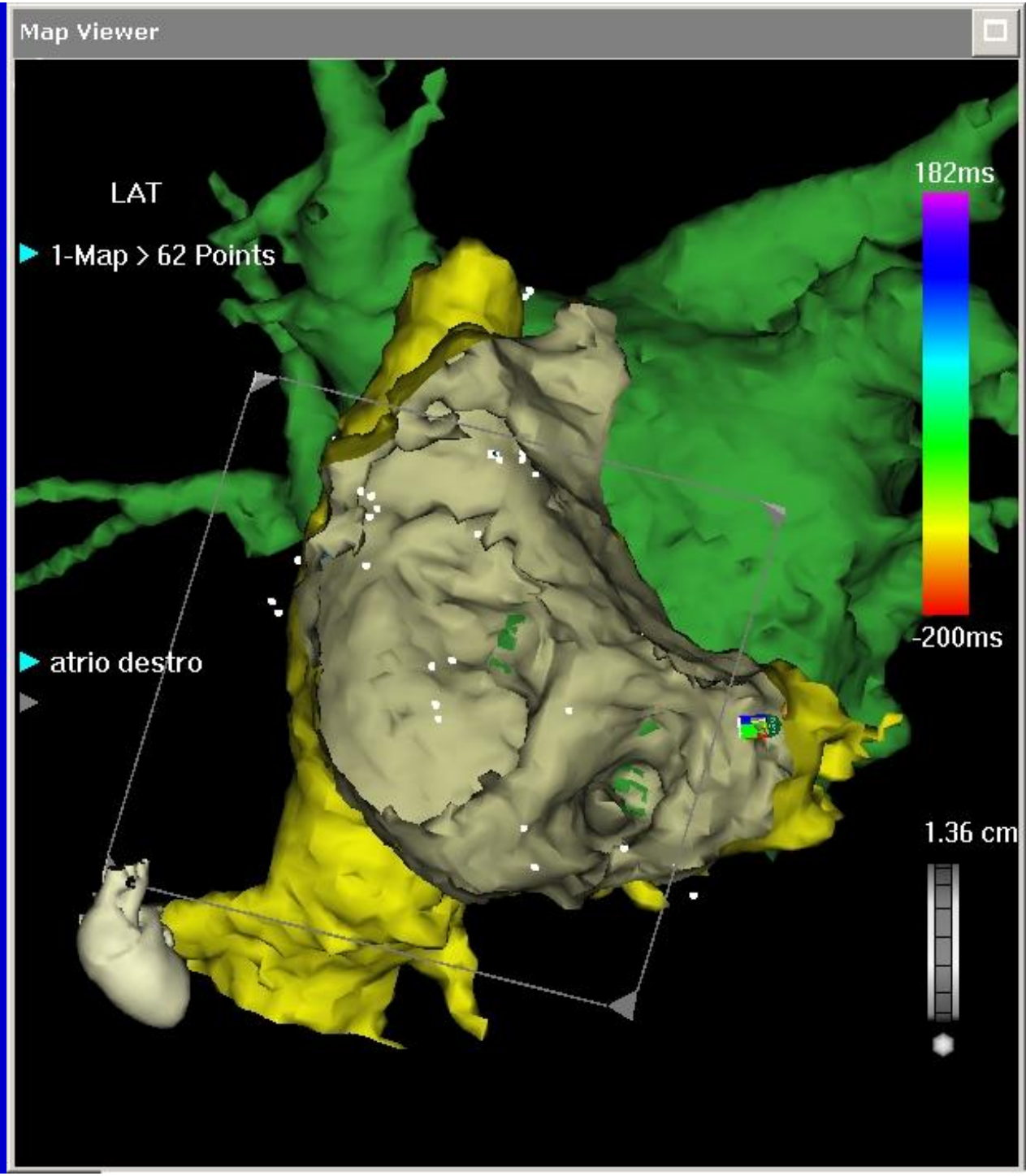
Circulation 2000;102:2619-2628



Pappone C et al. Circulation 2001;104:2539-2544

Mappa di voltaggio prima e dopo




Map Viewer
LAT
1-Map > 62 Points
atrio destro
182ms
-200ms
1.36 cm

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

Koonlawee Nademanee, MD, FACC,* John McKenzie, MD,* Erol Kosar, MD,* Mark Schwab, MD,* Buncha Sunsaneewitayakul, MD,† Thaveekiat Vasavakul, MD,* Chotikorn Khunnawat, MD,* Tachapong Ngarmukos, MD‡

Inglewood, California; and Bangkok, Thailand

CONCLUSIONS Areas with CFAEs represent a defined electrophysiologic substrate and are ideal target sites for ablations to eliminate AF and maintain normal sinus rhythm. (J Am Coll Cardiol 2004; 43:2044–53) © 2004 by the American College of Cardiology Foundation

How to perform electrogram-guided atrial fibrillation ablation

Koonlawee Nademanee, MD, Mark Schwab, MD, Joshua Porath, BSEE, MBA, Aharon Abbo, MD

Heart rhythm Volume: 3, Issue: 8, August, 2006,

pp. 981-984

Long-term evaluation of atrial fibrillation ablation guided by noninducibility

Pierre Jaïs, MD, Mélèze Hocini, MD, Prashanthan Sanders, MBBS, PhD, Li-Fern Hsu, MBBS, Yoshihide Takahashi, MD, Martin Rotter, MD, Thomas Rostock, MD, Frédéric Sacher, MD, Jacques Clementy, MD, Michel Haissaguerre, MD

From Hôpital Haut-Lévèque and Université Victor Ségalen, Bordeaux II, Bordeaux, France.

BACKGROUND Pulmonary vein (PV) isolation and linear lesions are effective in eliminating paroxysmal atrial fibrillation (AF), but linear lesions probably are not required in all patients. Noninducibility of AF has been shown to be associated with freedom from arrhythmia in 87% of patients.

OBJECTIVES The purpose of this study was to prospectively evaluate the role of noninducibility in guiding a stepwise approach tailored to the patient.

METHODS In 74 patients (age 53 ± 8 years) with paroxysmal AF, PV isolation was performed during induced or spontaneous AF. If AF was inducible after PV isolation, one to two additional linear lesions were placed at the mitral isthmus and/or left atrial roof, with the endpoint of noninducibility of AF or atrial flutter. Inducibility (AF/atrial flutter, lasting ≥10 minutes) was assessed using burst pacing at an output of 20 mA down to refractoriness from the coronary sinus and both atrial appendages.

RESULTS In 42 patients (57%), PV isolation restored sinus rhythm and rendered AF noninducible. In the 32 patients with persistent or inducible AF after PV isolation, a single linear lesion achieved noninducibility in 20, whereas two linear lesions were required in 12 and resulted in conversion to sinus rhythm and noninducibility in 10. Using this stepwise approach, a total of 69 patients (93%) were rendered noninducible. During follow-up of 18 ± 4 months, 67 patients (91%) were free from arrhythmia without antiarrhythmic drugs. Repeat procedures were performed in 23 patients: repeat ablation was required to consolidate prior targets in 15 patients (20%), and "new" linear lesions, which were not predicted by inducibility during the index procedure, were required in 8 (11%).

CONCLUSION Noninducibility can be used as an endpoint for determining the subset of patients with paroxysmal AF who require additional linear lesions after PV isolation. This tailored approach is effective in 91% of patients while preventing delivery of unnecessary linear lesions.

KEYWORDS Atrial fibrillation; Catheter ablation

(Heart Rhythm 2006;3:140–145)

Role of the Posterior Left Atrium and Pulmonary Veins in Human Lone Atrial Fibrillation

Electrophysiological and Pathological Data From Patients Undergoing Atrial Fibrillation Surgery

Derick M. Todd, MB ChB; Allan C. Skanes, MD; Gerard Guiraudon, MD; Colette Guiraudon, MD; Andrew D. Krahn, MD; Raymond Yee, MD; George J. Klein, MD

Background—Surgery can eliminate atrial fibrillation (AF), but data confirming the rationale for specific lesion sets are lacking. We used postoperative electrophysiological studies to test the rationale and effects of operative pulmonary venous isolation.

Methods and Results—Fourteen patients undergoing surgical pulmonary venous isolation for drug-refractory lone AF were studied. Successful isolation was confirmed postoperatively in 13 of 14 patients. Spontaneous sustained AF was recorded from the isolated pulmonary venous region (PVR) in 4 and was induced by extrastimulus testing in another. The remaining atrial region (RAR) was in sinus rhythm in 13 patients and nonsustained AF in 1. Atrial extrastimulus testing and burst pacing in the RAR failed to induce sustained AF. In follow-up, 1 patient developed paroxysmal AF, and electrical continuity between the PVR and RAR was confirmed. Isolation was achieved with radiofrequency ablation with no further AF. Another patient developed typical atrial flutter that required ablation. AF has not recurred in any patient at 25.1±11.9 months (range, 6 to 56 months) after surgery. Atrial histopathology was consistent with tachycardia-induced changes.

Conclusions—Total electrical isolation of the PVR controlled AF with excellent clinical outcome and appeared necessary for success. The isolated PVR can sustain spontaneous or induced AF, whereas the considerably larger RAR does not. These data provide a sound rationale for PVR in eliminating AF. **(*Circulation*. 2003;108:3108-3114.)**

Is Pulmonary Vein Isolation Necessary for Curing Atrial Fibrillation?

Giuseppe Stabile, MD; Pietro Turco, MD; Vincenzo La Rocca, MD; Pasquale Nocerino, MD; Eugenio Stabile, MD; Antonio De Simone, MD

Background—Pulmonary veins (PVs) play a pivotal role in initiating and perpetuating atrial fibrillation (AF). We investigated if PV electrical isolation from the left atrium is required for curing AF.

Methods and Result—Fifty-one patients with paroxysmal or persistent AF underwent circumferential radiofrequency ablation of PV ostia performed with an anatomic approach. The end point of the ablation procedure was the recording of low peak-to-peak bipolar potentials (<0.1 mV) inside the lesions. Left atrium pacing was used to assess the conduction between the PVs and the left atrium. During a mean follow-up period of 16.6±3.9 months, 41 patients (80.4%) were free of atrial arrhythmias. When patients with and without AF recurrence were analyzed, no significant difference was observed in the mean number of PVs in which the ablation end point was reached (3.4±1.2 versus 3.7±0.87) and PVs isolated (1.5±1.4 versus 1.6±1). We noted that, although in 29 of 41 patients (71%) without AF recurrence, the ablation end point was reached in all PVs mapped, it was only possible to demonstrate the isolation of all PVs mapped in 2 patients. On the other hand, in 7 of 10 patients (70%) with AF recurrence, the ablation end point was reached in all PVs mapped, whereas one patient had all PVs isolated.

Conclusions—Our findings show that with the use of a pure anatomic approach, it is possible to prevent AF in >80% of patients undergoing catheter ablation. Moreover, the isolation of PVs is not crucial for curing AF. **(*Circulation*. 2003; 108:657-660.)**

Radiofrequency Ablation of Atrial Fibrillation

Is the Persistence of All Intraprocedural Targets Necessary for Long-Term Maintenance of Sinus Rhythm?

Claudio Pratola, MD; Elisa Baldo, MD; Pasquale Notarstefano, MD;
Tiziano Toselli, MD; Roberto Ferrari, MD, PhD, FESC

Background—Several approaches have been developed for radiofrequency catheter ablation of atrial fibrillation, but the correct intraprocedural end point is still under debate, and few data exist about the destiny of ablation lesions over time. The aim of the present study was to evaluate the long-term maintenance of intraprocedural end points of ablation procedures.

Methods and Results—Inclusion criteria were (1) a previous ablation procedure of pulmonary vein (PV) encircling performed for drug-refractory persistent atrial fibrillation; (2) a "complete" intraprocedural end point, which consisted of voltage abatement inside the lesions, PV disconnection, and exit-block pacing from inside the lesions, attained in all PVs; and (3) stable sinus rhythm documented during a minimum follow-up of 2.5 years after the procedure. Twenty volunteers were selected (12 males, mean age 59±7 years) and underwent a repeat electrophysiological study. After a follow-up of 36.4±4.7 months, complete voltage abatement was maintained around 32 PVs (40.0%), PV disconnection persisted in 12 (37.5%) of the previously isolated PVs, and exit block was present in 39 PVs (48.7%). Ten patients who underwent a redo ablation procedure because of recurrences of atrial fibrillation were used as the control group. Differences in intraprocedural end-point maintenance between the 2 groups were not statistically significant.

Conclusions—Common intraprocedural end points such as voltage abatement, PV disconnection, and exit block persist only in a limited number of patients, even when the outcome is favorable during follow-up. Further investigation will be required to determine whether such data will have implications for ablation strategies. (***Circulation.*** **2008;117:136-143.)**

Key Words: atrial fibrillation ■ pulmonary veins ■ radiofrequency catheter ablation

Comparison Between Anatomical and Integrated Approaches to Atrial Fibrillation Ablation: Adjunctive Role of Electrical Pulmonary Vein Disconnection

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Role of Electrical Pulmonary Vein Disconnection. ***Introduction:*** **The aim of this study was to compare the outcome of anatomical pulmonary vein (PV) radiofrequency (RF) ablation with that of an integrated approach (anatomical with electrophysiological confirmation of PV disconnection).**

Methods: **Sixty consecutive patients affected by drug-refractory paroxysmal (39), persistent (13), and permanent (8) atrial fibrillation (AF) were assigned to an anatomical (group A: 30 patients; 25 male, 5 female, mean age: 55 ± 7 years) or integrated approach (group B: 30 patients; 26 male, 4 female, mean age: 52 ± 9 years). In all cases, RF ablation was performed by means of the Carto system in order to anatomically create circumferential lines around PVs. In group B, the persistence of PV potentials was then assessed with a multipolar circular catheter. If PV potentials persisted, RF pulses targeting the electrophysiological breakthroughs were delivered to disconnect PVs.**

Results: **Total procedure duration, fluoroscopy time, and RF delivery time were similar in both groups: 227 ± 43, 50 ± 23, and 43 ± 16 minutes (group A); 232 ± 32, 55 ± 15, and 42 ± 10 minutes (group B), respectively (ns). One asymptomatic PV stenosis and one pericardial effusion occurred in group A and B, respectively. After 15.4 ± 7.4 months, 17 (57%) group A patients and 25 (83%) group B patients were in stable sinus rhythm (P = 0.02) (RR 1.78; 95% CI: 1.7–2.9).**

Conclusions: **PV ablation by means of an integrated anatomical and electrophysiological approach seems more effective than a purely anatomical RF ablation approach. Electrophysiological confirmation of PV disconnection could be a useful marker of successful RF treatment of AF.** *(J Cardiovasc Electrophysiol, Vol. 16, pp. 1293-1297, December 2005)*

Worldwide Survey on the Methods, Efficacy, and Safety of Catheter Ablation for Human Atrial Fibrillation

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Background—The purpose of this study was to conduct a worldwide survey investigating the methods, efficacy, and safety of catheter ablation (CA) of atrial fibrillation (AF).

Methods and Results—A detailed questionnaire was sent to 777 centers worldwide. Data relevant to the study purpose were collected from 181 centers, of which 100 had ongoing programs on CA of AF between 1995 and 2002. The number of patients undergoing this procedure increased from 18 in 1995 to 5050 in 2002. The median number of procedures per center was 37.5 (range, 1 to 600). Paroxysmal AF, persistent AF, and permanent AF were the indicated arrhythmias in 100.0%, 53.0%, and 20.0% of responding centers, respectively. The most commonly used techniques were right atrial compartmentalization between 1995 and 1997, ablation of the triggering focus in 1998 and 1999, and electrical disconnection of multiple pulmonary veins between 2000 and 2002. Of 8745 patients completing the CA protocol in 90 centers, of whom 2389 (27.3%) required >1 procedure, 4550 (52.0%; range among centers, 14.5% to 76.5%) became asymptomatic without drugs and another 2094 (23.9%; range among centers, 8.8% to 50.3%) became asymptomatic in the presence of formerly ineffective antiarrhythmic drugs over an 11.6±7.7-month follow-up period. At least 1 major complication was reported in 524 patients (6.0%).

Conclusions—The findings of this survey provide a picture of the variable and evolving methods, efficacy, and safety of CA for AF as practiced in a large number of centers worldwide and may serve as a guide to clinicians considering therapeutic options in patients suffering from this arrhythmia. (***Circulation.*** **2005;111:1100-1105.**)

Key Words: fibrillation ■ catheter ablation ■ antiarrhythmia agents ■ follow-up studies

L'ablazione della fibrillazione atriale nel 2005: a che punto siamo?

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Ital Heart J Suppl Vol 6 Novembre 2005

Current Strategies in the Management of Atrial Fibrillation

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(Ann Thorac Surg 2006;82:357–64)

In summary, the type of lesion required for treatment of AF should be determined according to the type of AF, irrespective of the need for concomitant procedures. For patients with paroxysmal AF, PVI should suffice in approximately 90% of patients and the remainder will need additional lines of ablation performed. Both catheter ablation and surgical results indicate that in patients with permanent-persistent AF, PVI is insufficient and additional surgical lines are required, like right atrial ablation lines in patients with large right atria.

The future directions should determine the balance and efficacy of epicardial and endocardial approaches in the treatment of both permanent- persistent AF. Further studies, such as identification of triggers outside the pulmonary veins and the role of autonomic innervation, are required to improve the understanding of mechanisms of AF. Advances in these fields would enable surgeons and cardiologists to further the management of AF with improved results, and using minimal access techniques [77, 78] including robotic surgery with or without the use of cardiopulmonary bypass.86

(Ann Thorac Surg 2006;82:357–64)

Prevalence and Predictors of Complications of Radiofrequency Catheter Ablation for Atrial Fibrillation

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Complications of Atrial Fibrillation Ablation. ***Introduction:*** **Up to 6% of patients experience complications after radiofrequency catheter ablation (RFA) of atrial fibrillation (AF). The purpose of this study is to determine the prevalence and predictors of periprocedural complications after RFA for AF.**

Methods and Results: **The subjects were 1,295 consecutive patients (age = 60 ± 10 years) who underwent RFA (n = 1,642) for paroxysmal (53%) or persistent AF (47%) from January 2007 to January 2010. A complication occurred in 57 patients (3.5%); a vascular access complication in 31 (1.9%); pericardial tamponade in 20 (1.2%); a thromboembolic event in 4 (0.2%); deep venous thrombosis in 1 (<0.01%); and pulmonary vein stenosis in 1 patient (<0.01%). There were no procedure-related deaths. On multivariate analysis, female gender (OR = 2.27; ±95% CI: 1.31–2.57, P < 0.01) and procedures performed in July or August (OR = 2.10; ±95% CI: 1.16–3.80, P = 0.01) were independent predictors of any complication. For vascular complications, treatment with clopidogrel (OR = 4.40; ±95% CI: 1.43–13.53, P = 0.01), female gender (OR = 3.65; ±95% CI: 1.72–7.75, P < 0.01) and performing RFA in July or August (OR = 2.71; ±95% CI: 1.25–5.87, P = 0.01) were independent predictors. The only predictor of cardiac tamponade was prior RFA (OR = 3.32; ±95% CI: 0.95–11.61; P < 0.05).**

Conclusion: **Prevalence of perioperative complications for RFA of AF is 3.5% and vascular access complications constitute the majority. The need for clopidogrel therapy should be carefully considered prior to RFA. At teaching institutions close supervision should be exercised during vascular access early in the year. Improvements in ablation technology and elimination of the need for repeat procedures may decrease the risk of pericardial tamponade.** *(J Cardiovasc Electrophysiol, Vol. 22, pp. 626-631, June 2011)*

atrial fibrillation, catheter ablation, complications, pulmonary vein stenosis, stroke

Worldwide AFib Survey

- 181/777 Laboratori di tutti i continenti contattati
- 8.745 pz da 90 Laboratori
- 10.199 ATC x FA (90% in ASn)
- Periodo: 1995 – 2002
- Successo clinico:
  - 52% (range 14.5-76.5%) senza f. antiaritmici
  - 75.9% con f. antiaritmici
- Complicanze maggiori: **5.99%** ⟶ **3,5%**

Cappato R et al; Circulation 2004; in press

Approccio unico alla ablazione

- Non ipotizzabile lo stesso approccio nella FA del cuore sano e nella FA valvolare
- Esiste la necessità di individuare nei diversi pazienti approcci differenziati
- Esiste nella maggioranza dei casi un approccio proponibile
- Resta da chiarire quale è l'obiettivo della ablazione

ABLAZIONE DELLA FIBRILLAZIONE ATRIALE

Una cura definitiva

1) Sappiamo perché è iniziata ?
2) Sappiamo perché un trigger è “nato” o si è attivato ?
3) Possiamo stoppare l’evoluzione di una cardiopatia ?
4) Possiamo far rimodellare positivamente gli atrii ?

RADIOFREQUENCY CATHETER ABLATION TO CURE ATRIAL FIBRILLATION: MAYBE A WRONG TARGET

Claudio Pratola, Elisa Baldo, Pasquale Notarstefano, Tiziano Toselli, Roberto Ferrari

Journal of Cardiovascular Medicine

ABLAZIONE DELLA FIBRILLAZIONE ATRIALE

Qual è l'endpoint clinico della ablazione della FA

- Miglioramento della sopravvivenza ?
- E' sufficiente il miglioramento della qualità di vita e dei sintomi riferiti dal paziente?

Journal of the American College of Cardiology
© 2003 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 42, No. 2, 2003
ISSN 0735-1097/03/$30.00
doi:10.1016/S0735-1097(03)00577-1

CLINICAL RESEARCH **Clinical Trials**

Mortality, Morbidity, and Quality of Life After Circumferential Pulmonary Vein Ablation for Atrial Fibrillation

Outcomes From a Controlled Nonrandomized Long-Term Study

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OBJECTIVES This study was designed to investigate the potential of circumferential pulmonary vein (PV) ablation for atrial fibrillation (AF) to maintain sinus rhythm (SR) over time, thus reducing mortality and morbidity while enhancing quality of life (QoL).

BACKGROUND Circumferential PV ablation is safe and effective, but the long-term outcomes and its impact on QoL have not been assessed or compared with those for medical therapy.

METHODS We examined the clinical course of 1,171 consecutive patients with symptomatic AF who were referred to us between January 1998 and March 2001. The 589 ablated patients were compared with the 582 who received antiarrhythmic medications for SR control. The QoL of 109 ablated and 102 medically treated patients was measured with the SF-36 survey.

RESULTS Median follow-up was 900 days (range 161 to 1,508 days). Kaplan-Meier analysis showed observed survival for ablated patients was longer than among patients treated medically ($p < 0.001$), and not different from that expected for healthy persons of the same gender and calendar year of birth ($p = 0.55$). Cox proportional-hazards model revealed in the ablation group hazard ratios of 0.46 (95% confidence interval [CI], 0.31 to 0.68; $p < 0.001$) for all-cause mortality, of 0.45 (95% CI, 0.31 to 0.64; $p < 0.001$) for morbidities mainly due to heart failure and ischemic cerebrovascular events, and of 0.30 (95% CI, 0.24 to 0.37; $p < 0.001$) for AF recurrence. Ablated patients' QoL, different from patients treated medically, reached normative levels at six months and remained unchanged at one year.

CONCLUSIONS Pulmonary vein ablation improves mortality, morbidity, and QoL as compared with medical therapy. Our findings pave the way for randomized trials to prospect a wider application of ablation therapy for AF. (J Am Coll Cardiol 2003;42:185–97) © 2003 by the American College of Cardiology Foundation

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 2, 2004 VOL. 351 NO. 23

Catheter Ablation for Atrial Fibrillation in Congestive Heart Failure

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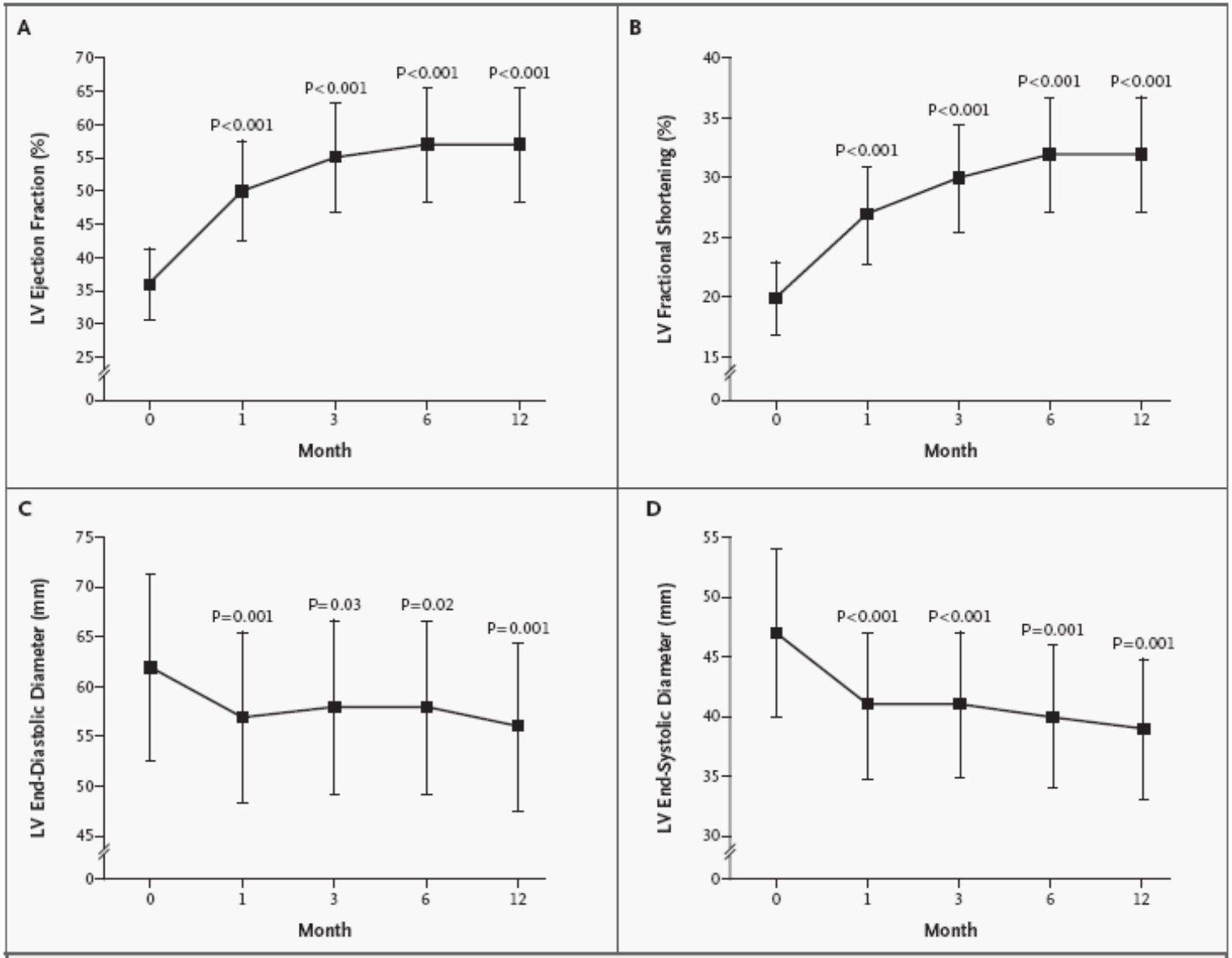


Figure 1. Improvement in Left Ventricular (LV) Function and Dimensions after Ablation in Patients with Congestive Heart Failure.

Plotted values are means ±SD. P values, which are for the comparison with baseline data, were determined with the use of Fisher's least-significant-difference test. The numbers of patients included at each time point were as follows: 0 month, 58; 1 month, 55; 3 months, 48; 6 months, 40; and 12 months, 34.

Cosa aspettarci dalla ablazione

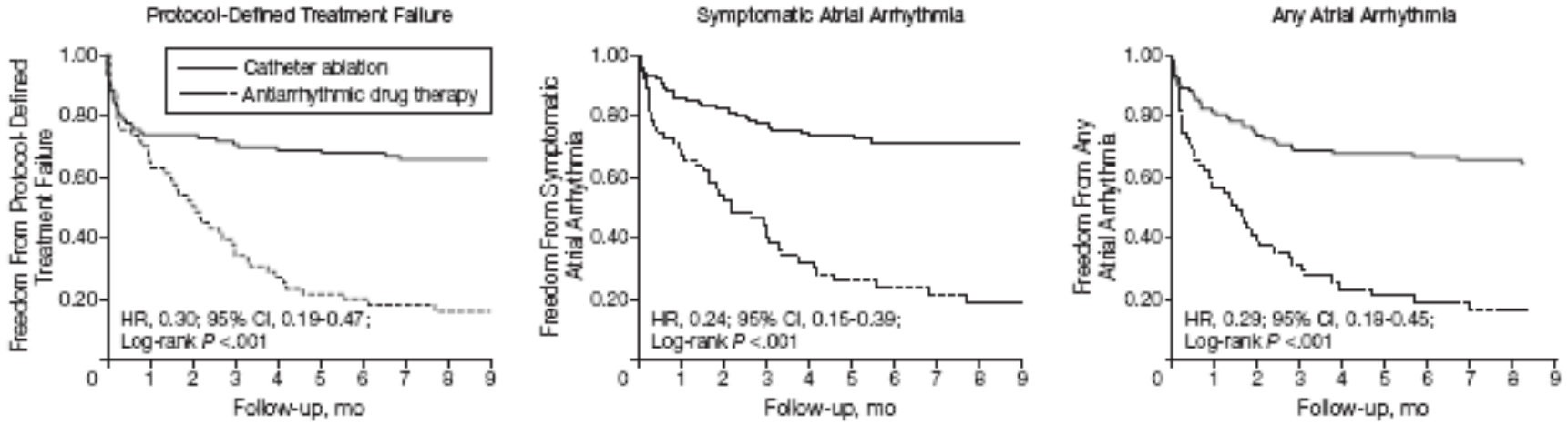
- Bassa incidenza di complicanze procedurali
- Oltre 75% dei pazienti resistenti alla terapia in ritmo stabile anche dopo 5 anni
- Non siamo autorizzati a parlare di guarigione
- Nessuna garanzia di sospendere la TAO e terapia antiaritmica (nei pazienti fino ad ora trattati)
- Necessari dati conclusivi di confronto tra terapia e ablazione ?

Comparison of Antiarrhythmic Drug Therapy and Radiofrequency Catheter Ablation in Patients With Paroxysmal Atrial Fibrillation

A Randomized Controlled Trial

David J. Wilber, MD

Figure 2. Kaplan-Meier Curves of Time to Protocol-Defined Treatment Failure, Recurrence of Symptomatic Atrial Arrhythmia, and Recurrence of Any Atrial Arrhythmia by Treatment Group



No. at risk										
Catheter ablation	106	75	75	72	70	70	69	67	65	51
Antiarrhythmic drug therapy	61	36	28	20	15	12	11	10	7	3
Catheter ablation	106	88	84	79	75	75	73	73	71	57
Antiarrhythmic drug therapy	61	37	27	21	15	12	11	10	7	4
Catheter ablation	106	84	78	72	70	70	69	68	65	52
Antiarrhythmic drug therapy	61	33	22	17	13	11	10	9	6	4

HR indicates hazard ratio; CI, confidence interval.

independent of the severity of the disease.[5,6] Restoration and maintenance of normal sinus rhythm following treat-

See also Patient Page.

Although antiarrhythmic drugs are generally used as first-line therapy to treat patients with AF, effectiveness remains inconsistent. The likelihood of AF recurrence within 6 to 12 months approaches 50% with most drugs.[9-11] Antiarrhythmic drugs are also associ-

accordingly become an alternative therapy for AF.[12] Several recent studies have

Author Affiliations and a List of the ThermoCool AF Trial Investigators appear at the end of this article.
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European Heart Journal (2010) 31, 2369–2429
doi:10.1093/eurheartj/ehq278

ESC GUIDELINES

Guidelines for the management of atrial fibrillation

The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC)

Developed with the special contribution of the European Heart Rhythm Association (EHRA)†

Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS)

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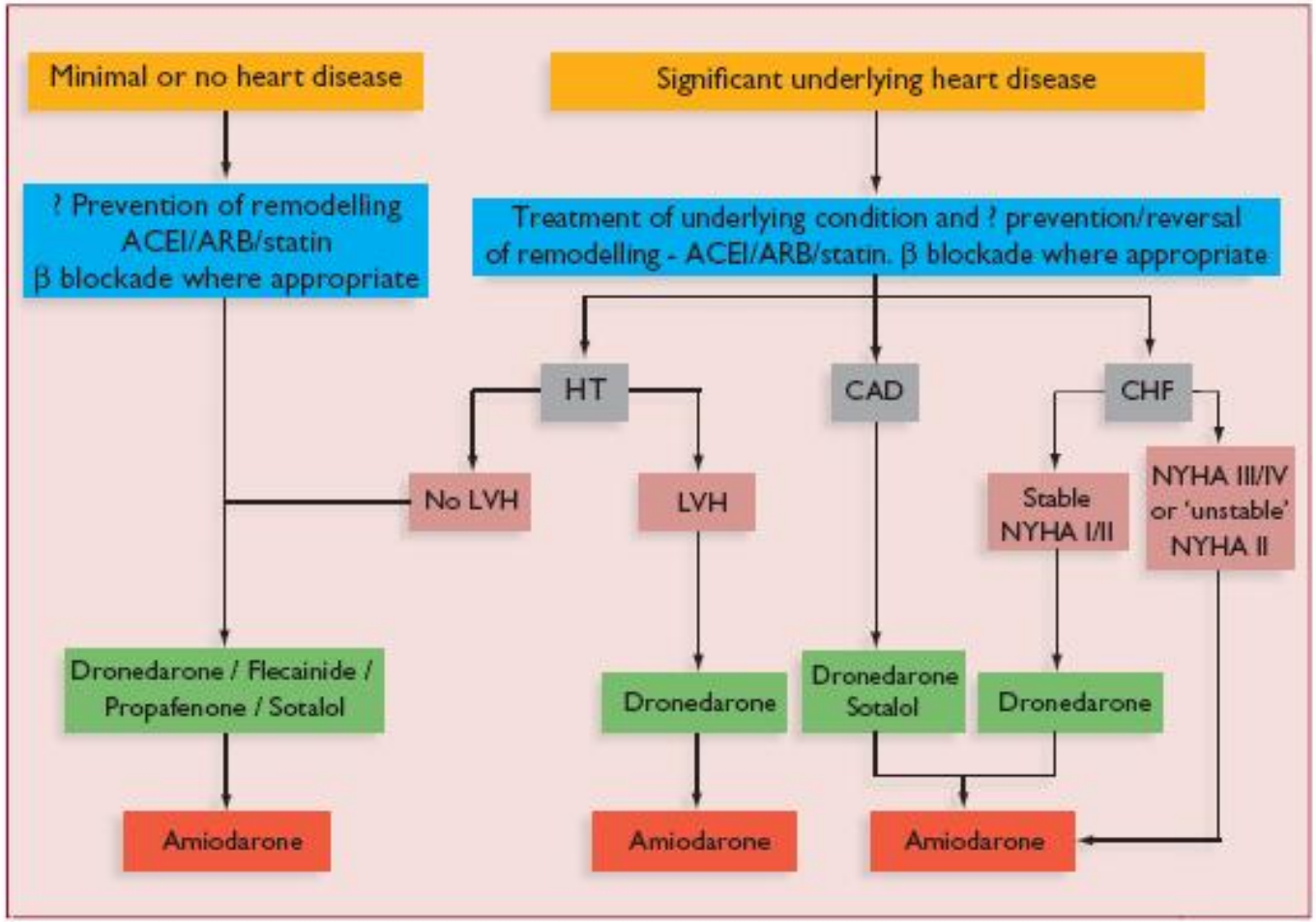
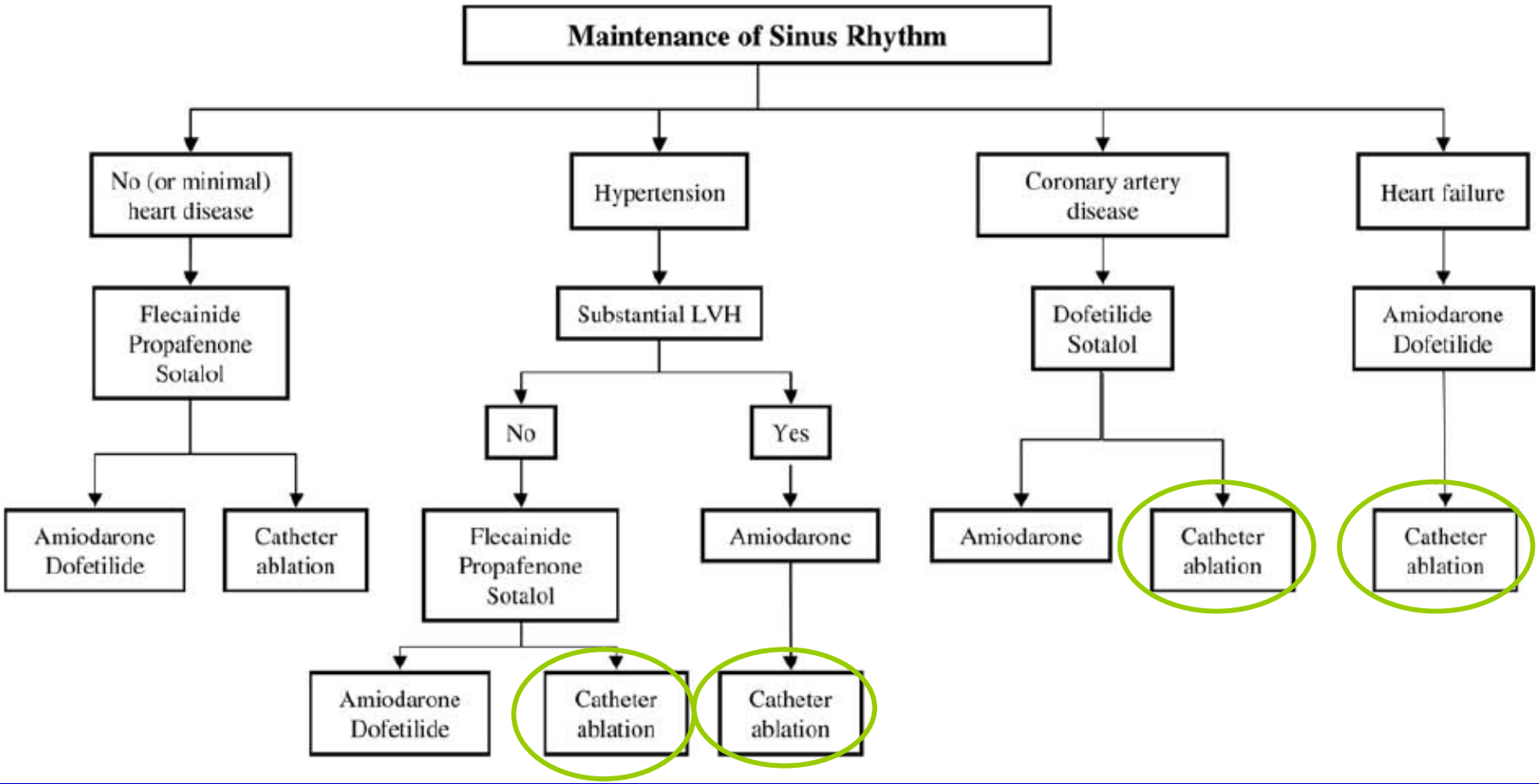


Figure 11 Choice of antiarrhythmic drug according to underlying pathology. ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CAD = coronary artery disease; CHF = congestive heart failure; HT = hypertension; LVH = left ventricular hypertrophy; NYHA = New York Heart Association; unstable = cardiac decompensation within the prior 4 weeks. Antiarrhythmic agents are listed in alphabetical order within each treatment box. ? = evidence for 'upstream' therapy for prevention of atrial remodelling still remains controversial.

ACC/AHA/ESC Guidelines

ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation: full text



2011 ACCF/AHA/HRS Focused Update on the Management of Patients With Atrial Fibrillation (Updating the 2006 Guideline)

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

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Table 3. Recommendation for Combining Anticoagulant With Antiplatelet Therapy

2011 Focused Update Recommendation	Comments
Class IIb	
1. The addition of clopidogrel to aspirin (ASA) to reduce the risk of major vascular events, including stroke, might be considered in patients with AF in whom oral anticoagulation with warfarin is considered unsuitable due to patient preference or the physician's assessment of the patient's ability to safely sustain anticoagulation (10). *(Level of Evidence: B)*	New recommendation

Table 4. Recommendations for Use of Dronedarone in Atrial Fibrillation

2011 Focused Update Recommendations	Comments
Class IIa	
1. Dronedarone is reasonable to decrease the need for hospitalization for cardiovascular events in patients with paroxysmal AF or after conversion of persistent AF. Dronedarone can be initiated during outpatient therapy (29). *(Level of Evidence: B)*	New recommendation
Class III–Harm	
1. Dronedarone should not be administered to patients with class IV heart failure or patients who have had an episode of decompensated heart failure in the past 4 weeks, especially if they have depressed left ventricular function (left ventricular ejection fraction ≤35%) (30). *(Level of Evidence: B)*	New recommendation

Table 5. Recommendations for Maintenance of Sinus Rhythm

2006 Recommendations	2011 Focused Update Recommendations	Comments
Class I		
Before initiating antiarrhythmic drug therapy, treatment of precipitating or reversible causes of AF is recommended. *(Level of Evidence: C)*	1. Before initiating antiarrhythmic drug therapy, treatment of precipitating or reversible causes of AF is recommended. *(Level of Evidence: C)*	2006 recommendation remains current.
	2. Catheter ablation performed in experienced centers* is useful in maintaining sinus rhythm in selected patients with significantly symptomatic, paroxysmal AF who have failed treatment with an antiarrhythmic drug and have normal or mildly dilated left atria, normal or mildly reduced LV function, and no severe pulmonary disease (38–51). *(Level of Evidence: A)*	Modified recommendation (class of recommendation changed from IIa to I, wording revised, and level of evidence changed from C to A).
Class IIa		
Pharmacological therapy can be useful in patients with AF to maintain sinus rhythm and prevent tachycardia-induced cardiomyopathy. *(Level of Evidence: C)*	1. Pharmacological therapy can be useful in patients with AF to maintain sinus rhythm and prevent tachycardia-induced cardiomyopathy. *(Level of Evidence: C)*	2006 recommendation remains current.
	6. Catheter ablation is reasonable to treat symptomatic persistent AF (38,48,55–64). *(Level of Evidence: A)*	New recommendation
Catheter ablation is a reasonable alternative to pharmacological therapy to prevent recurrent AF in symptomatic patients with little or no left atrium enlargement. *(Level of Evidence: C)*		Modified recommendation (class of recommendation changed from IIa to I, wording revised and level of evidence changed from C to A).
Sotalol can be beneficial in outpatients in sinus rhythm with little or no heart disease, prone to paroxysmal AF, if the baseline uncorrected QT interval is less than 460 ms, serum electrolytes are normal, and risk factors associated with Class III drug–related	5. Sotalol can be beneficial in outpatients in sinus rhythm with little or no heart disease, prone to paroxysmal AF, if the baseline uncorrected QT interval is less than 460 ms, serum electrolytes are normal, and risk factors associated with Class III drug–related	2006 recommendation remains current.
	symptomatic paroxysmal AF in patients with significant left atrial dilatation or with significant LV dysfunction (38,48,55–64). *(Level of Evidence: A)*	
Class III–Harm		
Antiarrhythmic therapy with a particular drug is not recommended for maintenance of sinus rhythm in patients with AF who have well-defined risk factors for proarrhythmia with that agent. *(Level of Evidence: A)*	1. Antiarrhythmic therapy with a particular drug is not recommended for maintenance of sinus rhythm in patients with AF who have well-defined risk factors for proarrhythmia with that agent (65,66). *(Level of Evidence: A)*	2006 recommendation remains current.
Pharmacological therapy is not recommended for maintenance of sinus rhythm in patients with advanced sinus node disease or AV node dysfunction unless they have a functioning electronic cardiac pacemaker. *(Level of Evidence: C)*	2. Pharmacological therapy is not recommended for maintenance of sinus rhythm in patients with advanced sinus node disease or AV node dysfunction unless they have a functioning electronic cardiac pacemaker. *(Level of Evidence: C)*	2006 recommendation remains current.

*Refers to pulmonary vein isolation with catheter ablation. An experienced center is defined as one performing more than 50 AF catheter ablation cases per year (67). Evidence-based technical guidelines including operator training and experience necessary to maximize rates of successful catheter ablation are not available; each center should maintain a database detailing procedures; success and complications, engage strategies for continuous quality improvement, and participate in registries and other efforts pooling data in order to develop optimal care algorithms (68).

*Refers to pulmonary vein isolation with catheter ablation. An experienced center is defined as one performing more than 50 AF catheter ablation cases per year (67). Evidence-based technical guidelines including operator training and experience necessary to maximize rates of successful catheter ablation are not available; each center should maintain a database detailing procedures; success and complications, engage strategies for continuous quality improvement, and participate in registries and other efforts pooling data in order to develop optimal care algorithms (68).

Raccomandazioni per il trattamento della fibrillazione atriale mediante ablazione transcatetere

Classe I

1. Pazienti non anziani con fibrillazione atriale parossistica/persistente, frequentemente recidivante, refrattaria alla terapia farmacologica (inefficacia, controindicazione o intolleranza ai farmaci antiaritmici), non legata a causa transitoria o eliminabile, e responsabile di sintomi importanti (quali palpitazioni, dispnea, astenia intensa, angina e sincope) che compromettono significativamente la qualità di vita (livello di evidenza B).

Classe IIa ?

1. Pazienti non anziani con fibrillazione atriale cronica refrattaria alla terapia farmacologica (inefficacia, controindicazione o intolleranza ai farmaci antiaritmici), non legata a causa transitoria o eliminabile, e responsabile di sintomi importanti (quali palpitazioni, dispnea, astenia intensa, angina e sincope) che compromettono significativamente la qualità di vita (livello di evidenza B).
2. Pazienti con fibrillazione atriale parossistica/persistente o fibrillazione atriale cronica in cui la comparsa e la persistenza dell'aritmia comportano un significativo peggioramento della funzione di pompa del cuore, nonostante adeguata terapia farmacologica per controllare la frequenza ventricolare e l'insufficienza cardiaca (livello di evidenza C).

Classe IIb

1. Pazienti anziani con fibrillazione atriale parossistica/persistente, frequentemente recidivante, refrattaria alla terapia farmacologica (inefficacia, controindicazione o intolleranza ai farmaci antiaritmici), non legata a causa transitoria o eliminabile, e responsabile di sintomi importanti (quali palpitazioni, dispnea, astenia intensa, angina e sincope) che compromettono significativamente la qualità di vita (livello di evidenza C).
2. Pazienti che opportunamente resi edotti dei vantaggi e rischi delle diverse opzioni terapeutiche scelgono la terapia ablativa per motivi psicologici o professionali (livello di evidenza C).

Stratificazione del Rischio Tromboembolico

Stratificazione del rischio tromboembolico in pazienti con FANV

Fattori di rischio Clinici

Fattori di rischio ECO

Fattori di rischio clinici

Età avanzata (> donne)

Ipertensione arteriosa

Scompenso cardiaco

Pregresso stroke – TIA

(Diabete mellito)

Fattori di rischio ECO TT

Dilatazione atriale sinistra

Disfunzione sistolica ventricolare sinistra

Fattori di rischio ECO TEE

Trombo atriale / auricolare sn

Ecocontrasto spontaneo

Disfunzione auricolare sn

Dilatazione auricolare sn

Aneurisma del setto interatriale

Placche aortiche complicate

Stratificazione del rischio tromboembolico in pazienti con FA

Rischio Alto	Rischio Moderato	Rischio Basso
1 FR maggiore	NO FR maggiore	NO FR maggiore
> 1 FR moderato	1 FR moderato	NO FR moderato

Fattori di Rischio MAGGIORI

- Età > 75 anni
- Precedente stroke od Embolismo sistemico
- Storia di ipertensione arteriosa
- Scompenso cardiaco o Disfunzione ventricolare sinistra
- Valvulopatia mitralica reumatica
- Portatore di protesi valvolare

Fattori di Rischio MINORI

- Età 65 - 75 anni
- Diabete mellito
- Cardiopatia ischemica con normale funzione ventricolare sinistra

Adattato da: 6th ACCP Consensus Conference on Antithrombotic Therapy, Chest 2001; 119 (Suppl) 194S-206S.

Table 19 Risk-based approach to antithrombotic therapy in patients with atrial fibrillation

Patient features	Antithrombotic therapy	grade of recommendation
Age less than 60 years, no heart disease (lone AF)	Aspirin (325 mg per day) or no therapy	I
Age less than 60 years, heart disease but no risk factors*	Aspirin (325 mg per day)	I
Age greater than or equal to 60 years, no risk factors*	Aspirin (325 mg per day)	I
Age greater than or equal to 60 years with diabetes mellitus or CAD	Oral anticoagulation (INR 2·0–3·0) Addition of aspirin, 81–162 mg per day is optional	I IIb
Age greater than or equal to 75 years, especially women	Oral anticoagulation (INR ≈2·0)	I
HF LV ejection fraction less than or equal to 0·35, thyrotoxicosis, and hypertension	Oral anticoagulation (INR 2·0–3·0)	I
Rheumatic heart disease (mitral stenosis)	Oral anticoagulation (INR 2·5–3·5 or higher may be appropriate)	
Prosthetic heart valves Prior thromboembolism Persistent atrial thrombus on TEE		

AF indicates atrial fibrillation; HF, heart failure; INR, international normalized ratio; LV, left ventricular; CAD, coronary artery disease; and TEE, transoesophageal echocardiography.
*Risk factors for thromboembolism include HF, LV ejection fraction less than 0·35, and history of hypertension.

ACC/AHA/ESC FA Guidelines, *European Heart Journal 2001, 22: 1852-1923.*

Table 3. $CHADS_2$ Risk Stratification Scheme (14)

Risk Factors	Score
C Recent congestive heart failure	1
H Hypertension	1
A Age ≥75 yrs	1
D Diabetes mellitus	1
S_2 History of stroke or transient ischemic attack	2

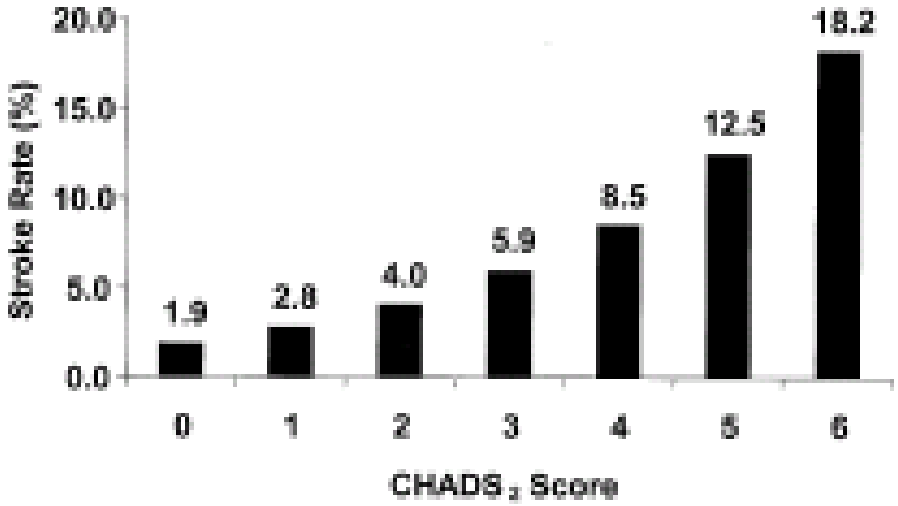

Figure 2. Relationship between the $CHADS_2$ score and the risk of stroke (14).

Table 8 CHA_2DS_2-VASc score and stroke rate

(a) Risk fact
'Major' risk f
Previous strok or systemic em Age ≥75 yea
(b) Risk factor-b scoring syste (Note: maximum sco
Risk factor
Congestive heart failu
Hypertension
Age ≥75
Diabetes mellitus
Stroke/TIA/thrombo-e
Vascular disease[a]
Age 65–74
Sex category (i.e. fema
Maximum score

A_2DS_2-VASc score	Adjusted stroke rate (%/year)[b]
	0%
	1.3%
	2.2%
	3.2%
	4.0%
	6.7%
	9.8%
	9.6%
	6.7%
	15.2%

aortic plaque. Actual rates
se estimates.

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iac catheterization, cardiac
r;

Table 9 Approach to thromboprophylaxis in patients with AF

Risk category	CHA_2DS_2-VASc score	Recommended antithrombotic therapy
One 'major' risk factor or ≥2 'clinically relevant non-major' risk factors	≥ 2	OAC[a]
One 'clinically relevant non-major' risk factor	1	Either OAC[a] or aspirin 75–325 mg daily. Preferred: OAC rather than aspirin.
No risk factors	0	Either aspirin 75–325 mg daily or no antithrombotic therapy. Preferred: no antithrombotic therapy rather than aspirin.

Table 10 Clinical characteristics comprising the HAS-BLED bleeding risk score

Letter	Clinical characteristic[a]	Points awarded
H	Hypertension	1
A	Abnormal renal and liver function (1 point each)	1 or 2
S	Stroke	1
B	Bleeding	1
L	Labile INRs	1
E	Elderly (e.g. age >65 years)	1
D	Drugs or alcohol (1 point each)	1 or 2
		Maximum 9 points

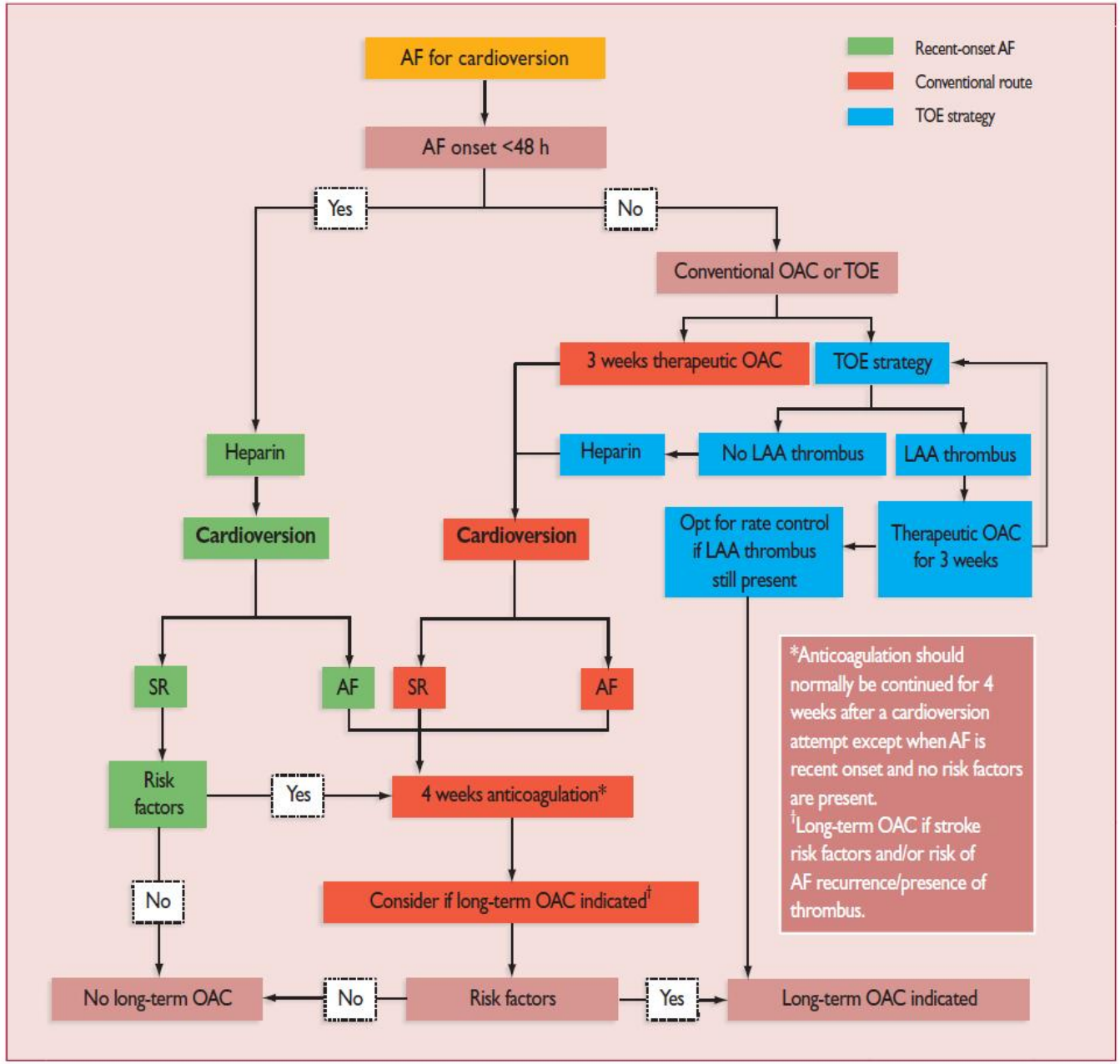


Figure 5 Cardioversion of haemodynamically stable AF, the role of TOE-guided cardioversion, and subsequent anticoagulation strategy. AF = atrial fibrillation; DCC = direct current cardioversion; LA = left atrium; LAA = left atrial appendage; OAC = oral anticoagulant; SR = sinus rhythm; TOE = transoesophageal echocardiography.

Table 11 Antithrombotic strategies following coronary artery stenting in patients with AF at moderate to high thrombo-embolic risk (in whom oral anticoagulation therapy is required)

Haemorrhagic risk	Clinical setting	Stent implanted	Anticoagulation regimen
Low or intermediate (e.g. HAS-BLED score 0–2)	Elective	Bare-metal	1 month: triple therapy of VKA (INR 2.0–2.5) + aspirin ≤100 mg/day + clopidogrel 75 mg/day Up to 12th month: combination of VKA (INR 2.0–2.5) + clopidogrel 75 mg/day[b] (or aspirin 100 mg/day) Lifelong: VKA (INR 2.0–3.0) alone
	Elective	Drug-eluting	3 (-olimus[a] group) to 6 (paclitaxel) months: triple therapy of VKA (INR 2.0–2.5) + aspirin ≤100 mg/day + clopidogrel 75 mg/day Up to 12th month: combination of VKA (INR 2.0–2.5) + clopidogrel 75 mg/day[b] (or aspirin 100 mg/day) Lifelong: VKA (INR 2.0–3.0) alone
	ACS	Bare-metal/ drug-eluting	6 months: triple therapy of VKA (INR 2.0–2.5) + aspirin ≤100 mg/day + clopidogrel 75 mg/day Up to 12th month: combination of VKA (INR 2.0–2.5) + clopidogrel 75 mg/day[b] (or aspirin 100 mg/day) Lifelong: VKA (INR 2.0–3.0) alone
High (e.g. HAS-BLED score ≥3)	Elective	Bare-metal[c]	2–4 weeks: triple therapy of VKA (INR 2.0–2.5) + aspirin ≤100 mg/day + clopidogrel 75 mg/day Lifelong: VKA (INR 2.0–3.0) alone
	ACS	Bare-metal[c]	4 weeks: triple therapy of VKA (INR 2.0–2.5) + aspirin ≤100 mg/day + clopidogrel 75 mg/day Up to 12th month: combination of VKA (INR 2.0–2.5) + clopidogrel 75 mg/day[b] (or aspirin 100 mg/day) Lifelong: VKA (INR 2.0–3.0) alone

ACS = acute coronary syndrome; AF = atrial fibrillation; INR = international normalized ratio; VKA = vitamin K antagonist.
Gastric protection with a proton pump inhibitor (PPI) should be considered where necessary.
[a]Sirolimus, everolimus, and tacrolimus.
[b]Combination of VKA (INR 2.0–3.0) + aspirin ≤100 mg/day (with PPI, if indicated) may be considered as an alternative.
[c]Drug-eluting stents should be avoided as far as possible, but, if used, consideration of more prolonged (3–6 months) triple antithrombotic therapy is necessary.
Adapted from Lip *et al.*[61]

Comparison of Anticoagulation Clinic Patient Outcomes With Outcomes From Traditional Care in a Family Medicine Clinic

Marvin A. Chamberlain, RPh, MS, Nannette A. Sageser, Pharm D, and David Rutz, MD

Background: **Giving patients oral anticoagulation therapy in an ambulatory clinic setting is associated with substantial risk of adverse outcomes leading to emergency department visits and unplanned inpatient admissions. This article describes an effectiveness study conducted in a well-characterized family practice setting that compares anticoagulation outcomes in patients managed by a traditional care model with outcomes obtained with an anticoagulation clinic model.**

Methods: **All study patients received continuous anticoagulation care at the Family Medicine of Southwest Washington (FMSW) clinic during the 1-year study period. The method was retrospective and used linked record review, including outpatient, inpatient, and emergency department records. Patients were divided into two groups as naturally observed: those treated in the clinic by traditional care compared with those treated in an anticoagulation clinic model. Data analyses compared the two groups in terms of patient demographics, anticoagulation control, and inpatient admissions and emergency department visits that were related to clotting or bleeding events.**

Results: **There were no differences in demographic variables between the anticoagulation clinic and traditional care groups. There was a statistically significant difference in anticoagulation control as measured by international normalized ratio (INR) values. The anticoagulation clinic group had fewer INR values outside the target range, ± 0.1, than the traditional care group (40.4% vs 47.3% $P = .022$). The anticoagulation clinic group also had significantly fewer INR tests drawn more than 6 weeks apart than the traditional care group (3.7% vs 8.1% $P = .01$). There was no statistically significant difference in emergency department visit rates caused by adverse events. Inpatient admission rates for the anticoagulation clinic and traditional care groups were not statistically different; however, they were clinically different (4.7 vs 19.7 admissions per 100 patient years of therapy $P = .15$).**

Conclusions: **More anticoagulation patients treated by the anticoagulation clinic model at FMSW received an INR test at least every 6 weeks than those treated by the traditional care model, and more of their INR results were within target range ± 0.1 when compared with the traditional care model. (J Am Board Fam Pract 2001;14:16–21.)**

Table 1. Demographic Data of Patients in the Traditional Care (n = 75) and Anticoagulant Clinic (n = 41) Groups.

Demographic Characteristic	Traditional Care Group	Anticoagulation Clinic Group	*P* Value
Age, years (mean ± SD)	62.7 ± 15.5	64.2 ± 14.8	NS
Median	66.0	68.0	
Sex, % female	56	61	NS
Indication for anticoagulation, No (%)			NS
Atrial fibrillation	28 (37.3)	20 (48.8)	
Aortic or mitral valve replacement	9 (12.0)	5 (12.2)	
Cardiovascular disease	16 (21.3)	5 (12.2)	
Deep venous thrombosis	12 (16.0)	4 (9.8)	
Pulmonary edema	4 (5.3)	4 (9.8)	
Miscellaneous	6 (8.0)	3 (7.3)	
Days in study (mean ± SD)	197 ± 121.3	188.1 ± 122	NS
Median	190	176	
Patient years in study	40.58	21.12	

Table 2. Anticoagulation Control of Traditional Care and Anticoagulant Groups.

International Normalized Ratio Data	Traditional Care Group	Anticoagulation Group	*P* Value
Number of tests	709	446	
Number of tests per patient year	17.47	21.12	
Highest ratio (median)	3.94	3.70	
Lowest ratio (median)	1.4	1.52	
Values normalized, No. (%)	20 (2.82)	3 (0.67)	
Percent in range	45.8	50.2	NS
Percent above range	19.6	16.8	NS
Percent below range	34.6	33	NS
Tests > ± 0.1 from target range, No. (%)	335 (47.2)	180 (40.3)	.022
Tests > ± 0.2 from target range, No. (%)	303 (42.7)	149 (33.4)	<.01
Tests > ± 0.5 from target range, No. (%)	193 (27.2)	69 (15.5)	<.01
Number of tests for 6-week variable	630	404	
Tests > 6 weeks apart, No. (%)	51 (8.1)	15 (3.7)	.01

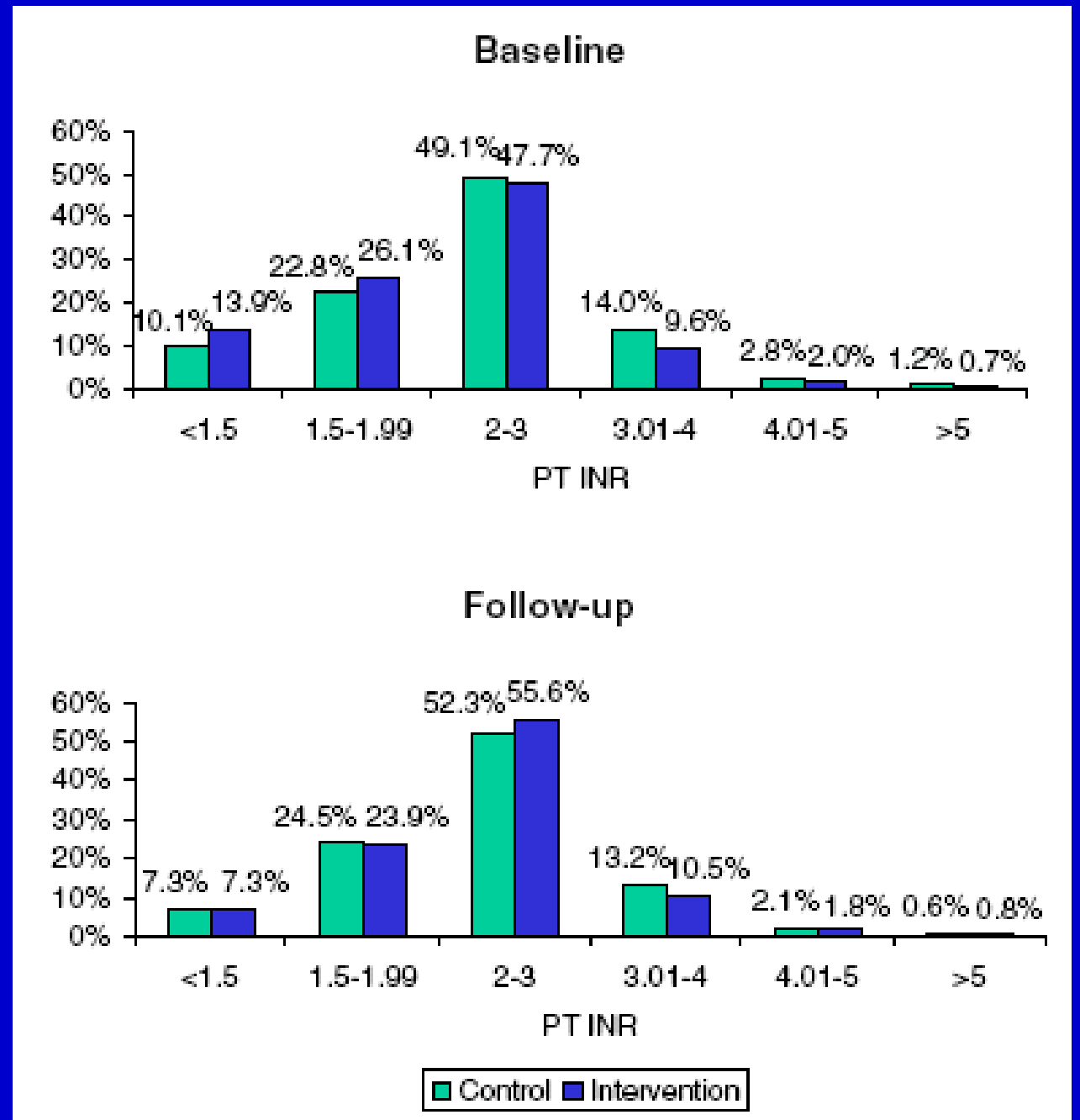
Table 3. Adverse Event Rates for Traditional Care and Anticoagulant Clinic Groups.

Adverse events	Traditional Care Group	Anticoagulant Clinic Group	Rate Difference 95% CI	*P* Value
Emergency department visits	6	2	0.053 (−0.12 to 0.23)	.63
Rate per patients year	0.148	0.095		
Rate per 100 patient years	14.8	9.5		
Inpatient admissions	8	1	0.15 (−0.02 to 0.32)	.15
Rate per patient year	0.197	0.047		
Rate per 100 patient years	19.7	4.7		

Table 4. Study Results Without 10 Crossover Patients.

Study Demographic	Traditional Care Group (n = 65)	Anticoagulant Clinic Group (n = 31)	*P* Value
Patient years in study	36.87	18.46	
INR in range, %	45.9	52.6	.04
INR above range, %	20.1	15.3	.06
Emergency department	4	2	
visits	0.1085	0.1083	>.99
Rate per patient year			
Inpatient admissions	6	1	
Rate per patient year	0.1627	0.0541	.32

Note: only comparisons that differed from the original results are presented.
INR = International normalized ratio.


Baseline
60%
50%
40%
30%
20%
10%
0%
10.1%
13.9%
22.8%
26.1%
49.1%
47.7%
14.0%
9.6%
2.8%
2.0%
1.2%
0.7%
<1.5
1.5-1.99
2-3
3.01-4
4.01-5
>5
PT INR
Follow-up
60%
50%
40%
30%
20%
10%
0%
7.3%
7.3%
24.5%
23.9%
52.3%
55.6%
13.2%
10.5%
2.1%
1.8%
0.6%
0.8%
<1.5
1.5-1.99
2-3
3.01-4
4.01-5
>5
PT INR
Control
Intervention

Canadian Journal of Cardiology 27 (2011) 506–513

Clinical Research

In-Hospital Management of Atrial Fibrillation: The $CHADS_2$ Score Predicts Increased Cost

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ABSTRACT

Background: Hospitalizations for atrial fibrillation (AF) impose a substantial burden on our health care system, and AF management strategies are increasingly focused on hospitalization reduction. The objectives of this study were to determine the cost of hospitalization for AF and to identify the main determinants of this cost in a Canadian setting.

Methods: Our study population consisted of patients hospitalized for AF and/or atrial flutter at a tertiary care hospital in Canada between April 1, 2001, and March 31, 2007. Patient-level demographics and data on clinical resource use and cost of treatment were collected from a computerized resource use and cost accounting system. The main determinants of in-hospital costs were identified through Bayesian model averaging.

Results: Data were collected on 325 consecutive hospitalizations for AF. The median length of stay was 5 days (interquartile range [IQR], 3-9). The mean cost of an AF admission was CAD$4740 (SD = CAD$4457), and the median was CAD$3532 (IQR, CAD$2013-CAD$5944). Multivariate analysis identified 2 independent predictors of increased cost: $CHADS_2$ score (relative increase in cost: 1.24; 95%

RÉSUMÉ

Introduction : Les hospitalisations pour la fibrillation auriculaire (FA) imposent un fardeau substantiel à notre système de soins de santé, et les stratégies de gestion de la FA sont de plus en plus focalisées sur la diminution de l'hospitalisation. Les objectifs de cette étude étaient de déterminer les coûts d'hospitalisation pour une FA et de définir les principaux déterminants de ce coût dans le cadre canadien.

Méthodes : La population à l'étude consistait en des patients hospitalisés pour une FA et/ou un flutter auriculaire dans un hôpital de soins tertiaires du Canada, entre le 1er avril 2001 et le 31 mars 2007. Les caractéristiques sociodémographiques des patients, et les données sur l'utilisation des ressources cliniques et le coût des traitements ont été recueillies d'un système comptable informatisé. Les principaux déterminants des coûts d'hospitalisation ont été définis par la moyenne du modèle bayésien.

Résultats : Les données ont été recueillies de 325 hospitalisations consécutives pour une FA. La durée médiane du séjour a été de cinq jours (écart interquartile [ÉIQ], 3-9). Le coût moyen d'une admission pour une FA a été de 4 740 $ CAN (σ = 4 457 $ CAN), et la médiane a été de 3 532 $ CAN (ÉIQ, 2 013 $ CAN – 5 944 $ CAN). L'analyse multivariable a déterminé deux prédicteurs indépendants de

Alternatives to the inpatient use of warfarin should be considered in all patients in an effort to decrease potentially avoidable admissions and shorten length of stay.[30] For instance, increasing the size of current anticoagulation clinics, pharmacy-managed anticoagulation, use of outpatient bridging with low molecular weight heparin, and the introduction of point-of-care testing devices may significantly decrease inpatient stay.[31-33] Hospitalizations may also be prevented by early performance of cardioversion with discharge from the emergency department, particularly in patients with a $CHADS_2$ score of 0, for whom anticoagulation can be avoided if the patient is cardioverted within 48 hours of AF onset. Another potential way to decrease length of stay is to use, as alternatives to warfarin, novel oral anticoagulants with shorter half-lives that do not require INR monitoring. Recently, an oral direct thrombin inhibitor (dabigatran) was shown to be superior to warfarin in terms of stroke reduction, with no difference in bleeding in patients with nonvalvular AF.[34] This medication has also been shown to be a cost-effective alternative to warfarin in patients with a $CHADS_2$ score ≥ 1.[35] The drug was recently approved by both the US Food and Drug Administration and Health Canada for the prevention of stroke and systemic embolism in patients with AF and recommended in the recently presented Canadian Cardiovascular Society (CCS) 2010 AF guidelines update.[36] (Other oral anticoagulants, including factor Xa inhibitors, are under evaluation as alternatives to warfarin.[37]).

Cost (Canadian Dollars)

Table 3. Hospital course

Variable

Length of stay (days): medi
In-hospital mortality (%)
Procedure use (%)
TTE
TEE
Electrical cardioversion
Pacemaker
Defibrillator
Angiogram

TEE, transesophageal e

d/or atrial flutter

$CHADS_2$ ≥ 3 (79)	All patients (n = 325)
12)	5 (3-9)
3	0.6
6	48.9
7	18.2
9	21.5
7	13.5
3	0.6
7	10.5

Circulation American Heart

Table 2. Recommendation for Emerging Antithrombotic Agents

2011 Focused Update Recommendation	Comments
Class I	
1. Dabigatran is useful as an alternative to warfarin for the prevention of stroke and systemic thromboembolism in patients with paroxysmal to permanent AF and risk factors for stroke or systemic embolization who do not have a prosthetic heart valve or hemodynamically significant valve disease, severe renal failure (creatinine clearance ≤15 mL/min), or advanced liver disease (impaired baseline clotting function).[3] *(Level of Evidence: B)*	New recommendation