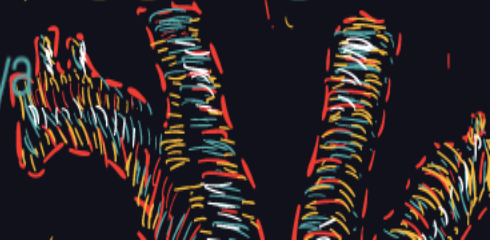




# 11. Atriyal Fibrilasyon Zirvesi 2022

9 - 10 Aralık 2022 • Spice Kongre Merkezi, Antalya



## Persistan AF Ablasyonunda Zor Alanlar Lineer Ablasyonlar

**Dr. Seluk Kanat**

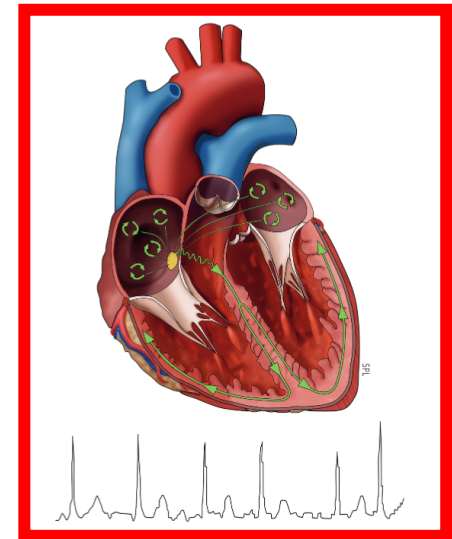
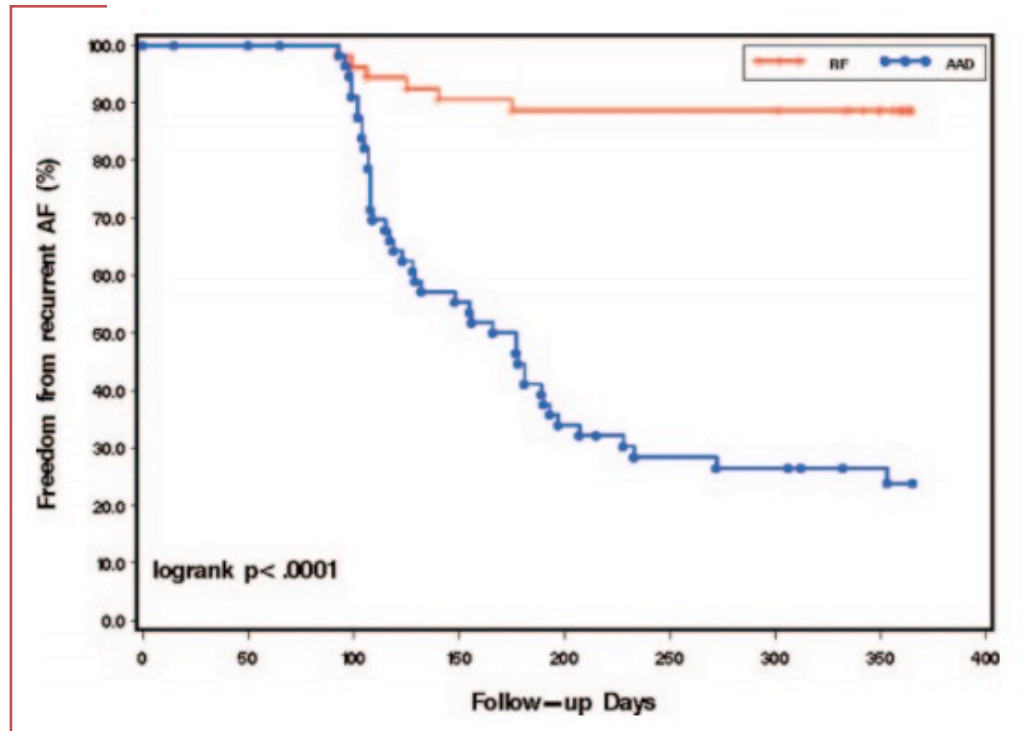
# Atrial Fibrilasyon Katater Ablasyonu

## Arrhythmia/Electrophysiology

### Catheter Ablation Versus Antiarrhythmic Drugs for Atrial Fibrillation

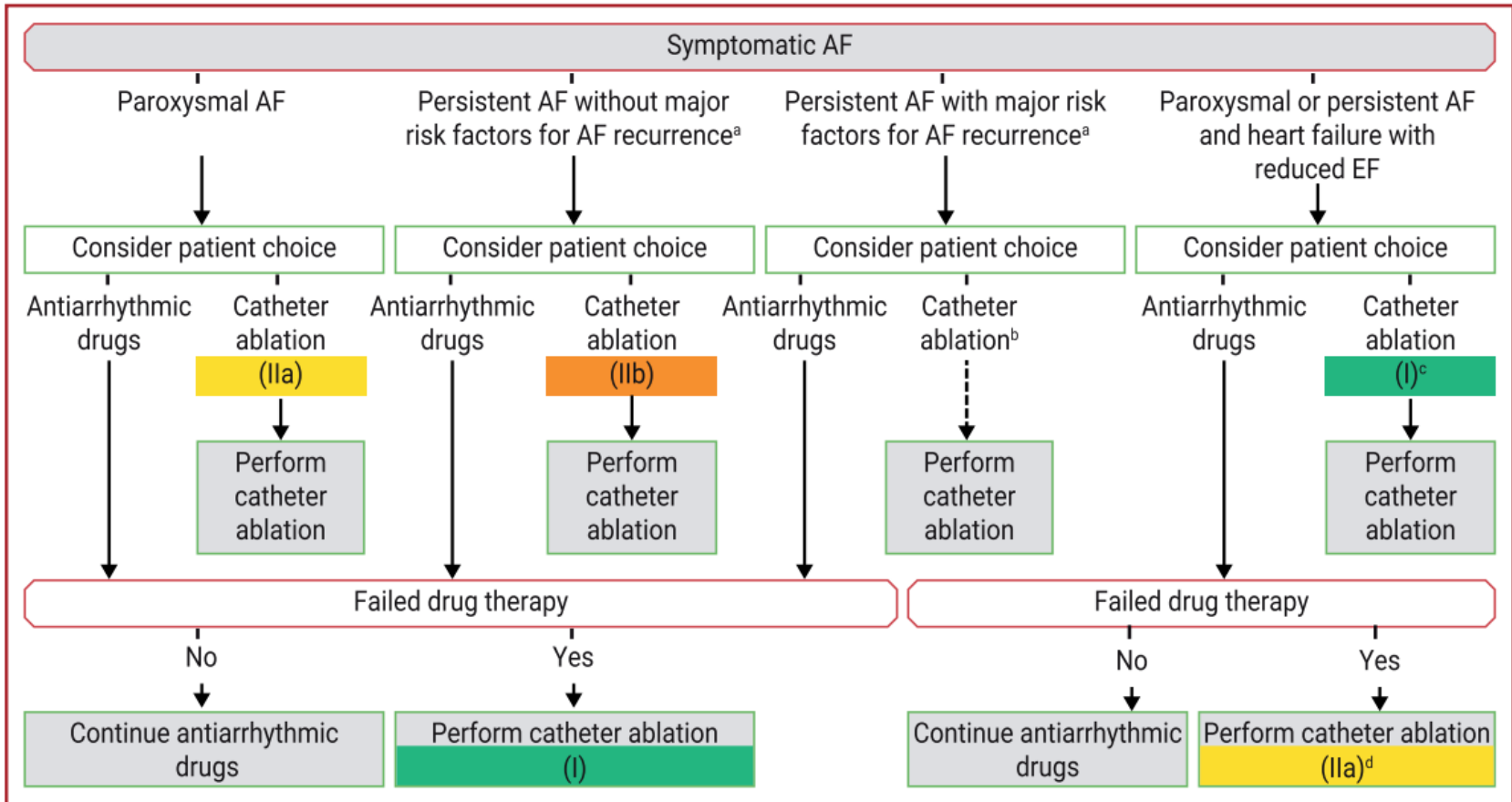
#### The A4 Study

Pierre Jaïs, MD; Bruno Cauchemez, MD; Laurent Macle, MD; Emile Daoud, MD;  
Paul Khairy, MD, PhD; Rajesh Subbiah, BSc (Med), MBBS, PhD; Mélèze Hocini, MD;  
Fabrice Extramiana, MD; Frédéric Sacher, MD; Pierre Bordachar, MD; George Klein, MD;  
Rukshen Weerasooriya, MBBS; Jacques Clémenty, MD; Michel Haïssaguerre, MD

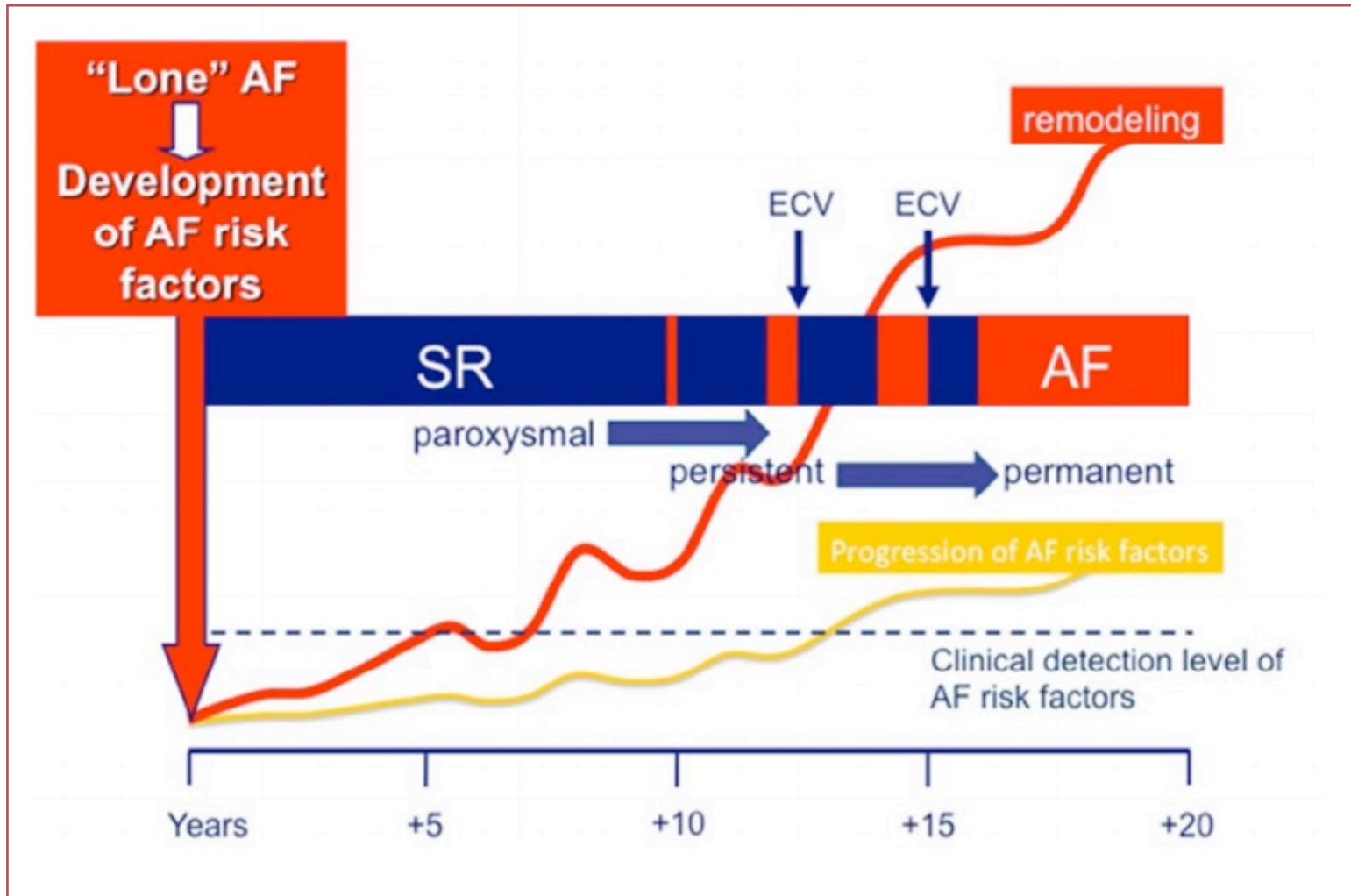


(*Circulation*. 2008;118:2498-2505.)

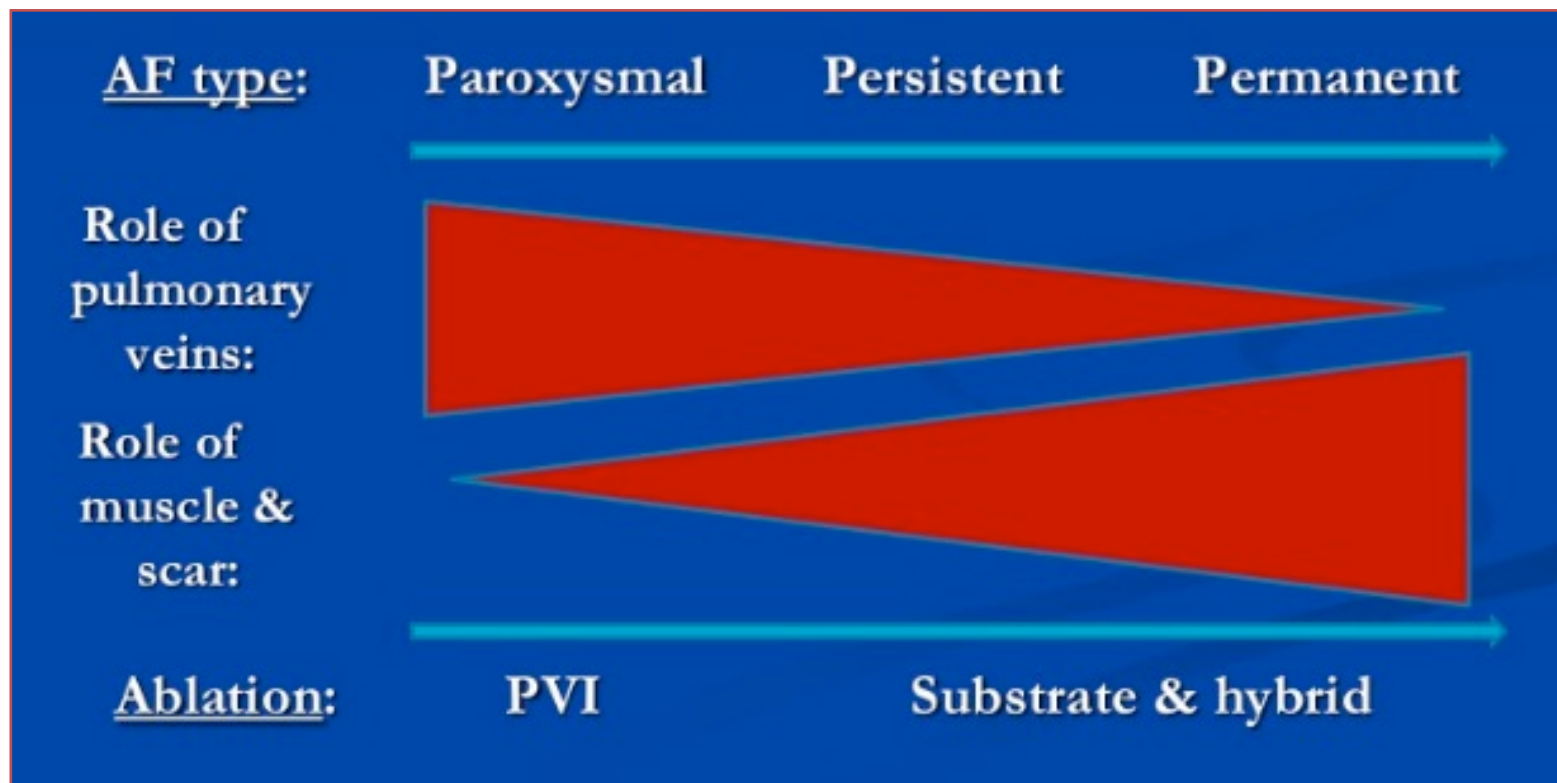
# Atrial Fibrilasyon Katater Ablasyonu



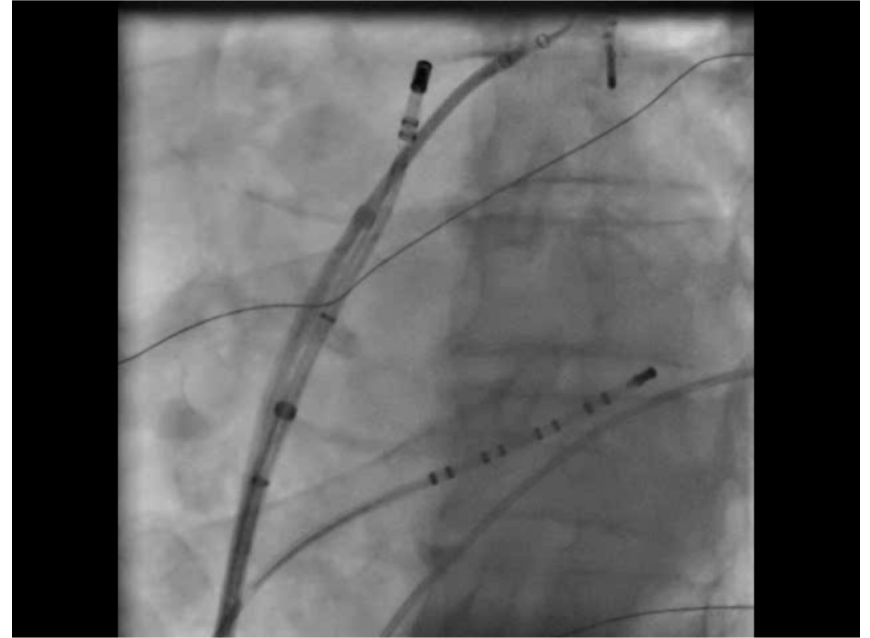
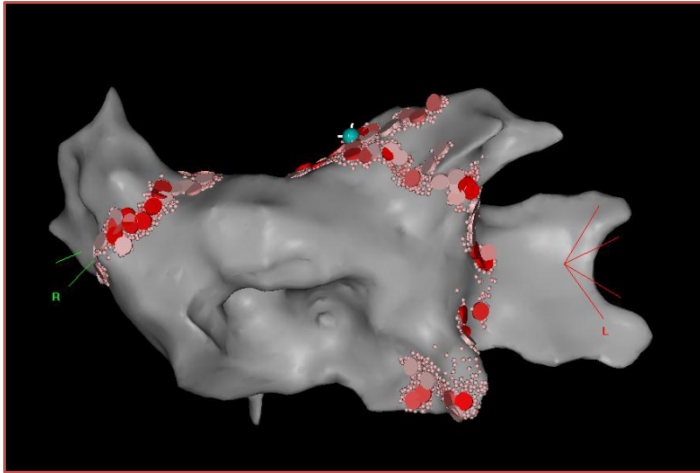
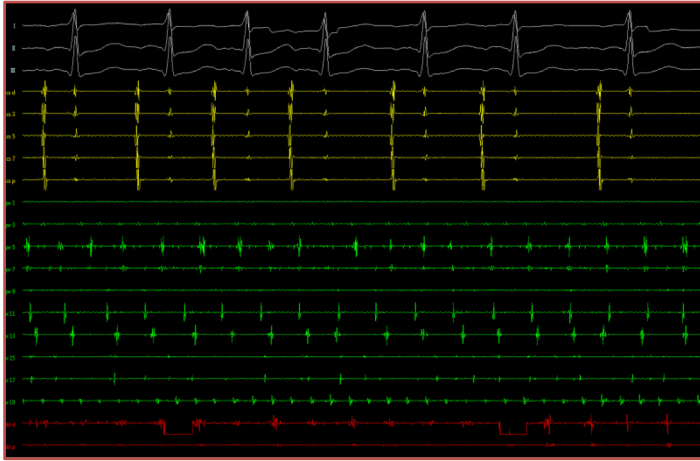
# Atrial Fibrilasyon Patofizyolojisi



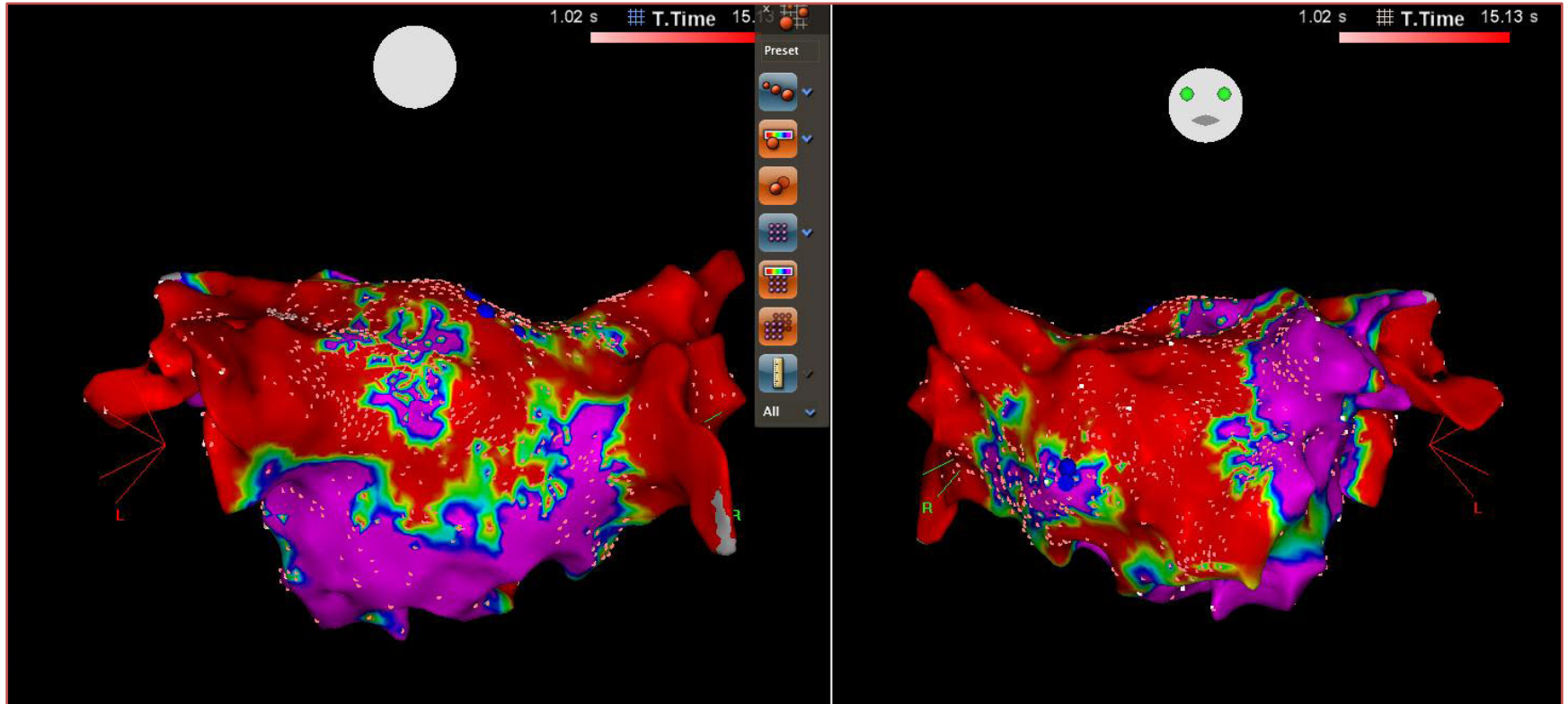
# Atrial Fibrilasyon Patofizyoloji



# PVI izolasyonu



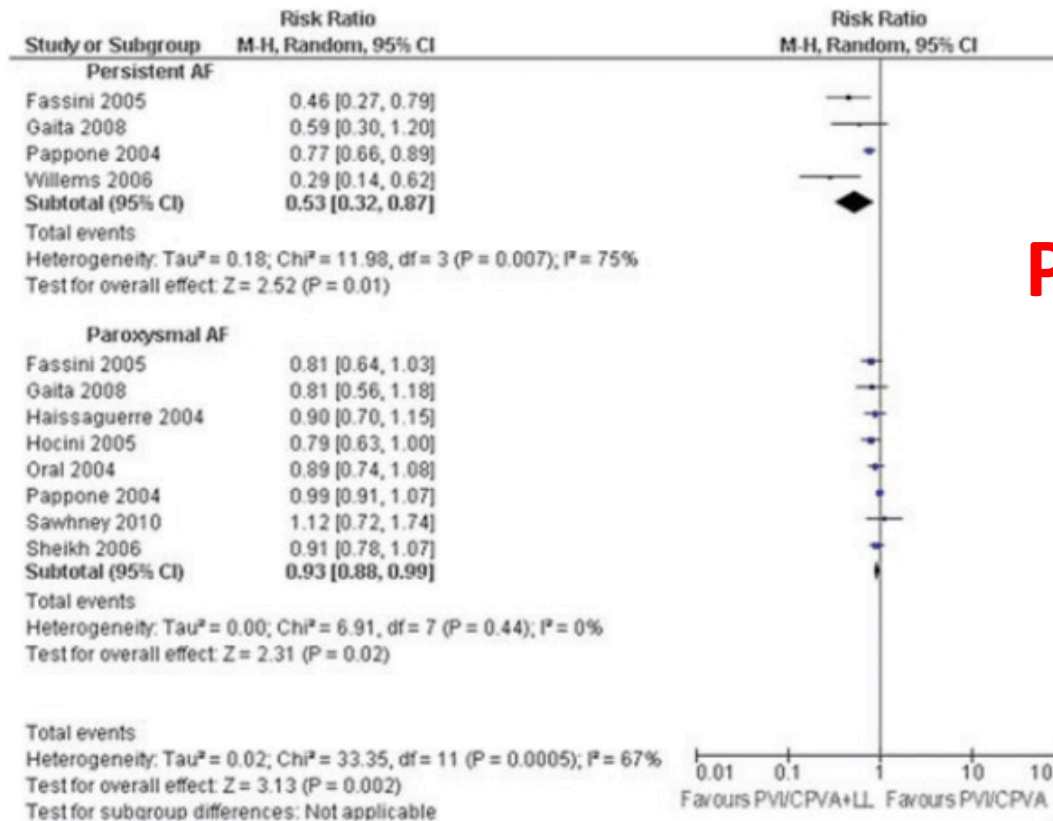
# Atrial Fibrilasyon Patofizyolojisi



# Approach to the Catheter Ablation Technique of Paroxysmal and Persistent Atrial Fibrillation: A Meta-Analysis of the Randomized Controlled Trials

RATIKA PARKASH, M.D., M.Sc.,\* ANTHONY S.L. TANG, M.D.†  
 JOHN L. SAPP, M.D.,\* and GEORGE WELLS, Ph.D.‡

From the \*Queen Elizabeth II Health Sciences Centre, Halifax, Canada; †Royal Jubilee Hospital, Victoria, Canada; and ‡University of Ottawa Heart Institute, Ottawa, Canada

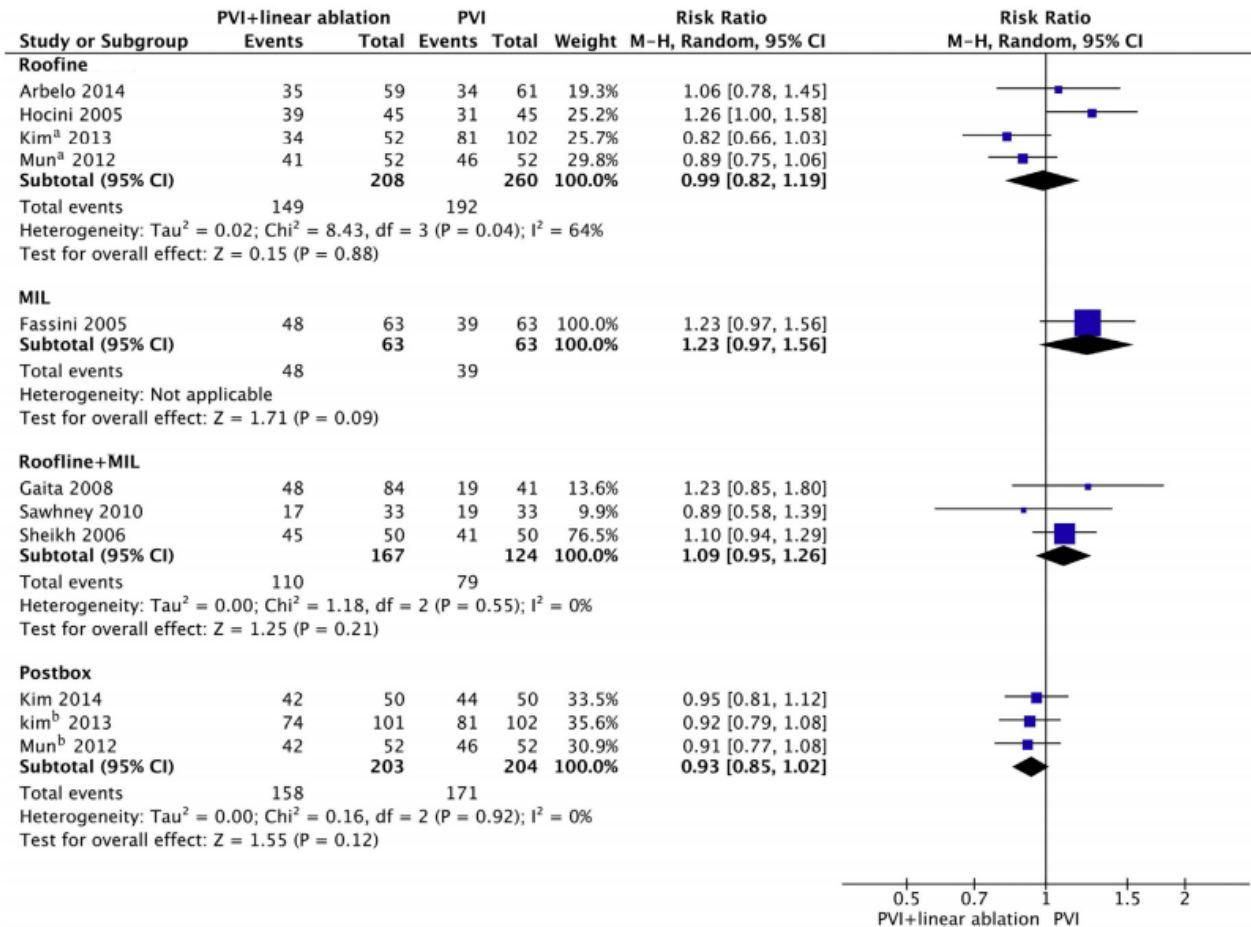




# Is there still a role for additional linear ablation in addition to pulmonary vein isolation in patients with paroxysmal atrial fibrillation? An Updated Meta-analysis of randomized controlled trials☆

Xiaoliang Hu <sup>1</sup>, Jingzhou Jiang <sup>1</sup>, Yuedong Ma <sup>1</sup>, Anli Tang <sup>\*,1</sup>

Department of Cardiology, First Affiliated Hospital of Sun Yat-sen University, Guangzhou, Guangdong, People's Republic of China



PVI+LL / PVI

# Paroksizmal AF Ablasyonu

- PAF'da ablasyon stratejimiz , PAF olmayanlara göre daha açıktır
- Hasta özelinde deęerlendirmekle beraber PVI yeterli olduęu görölmektedir.

# Persistan AF Ablasyonu

- PAF ile karşılaştırıldığında PeAF'de PV tetikleyicileri daha az önemlidir.
- Bu hastalarda çoğu zaman tek başına PVI yeterli değildir.
- Çoğu zaman başarıyı arttırmak için PV dışı tetikleyicilerin yada substratın ablasyonu gerekmektedir.

## Outcomes of long-standing persistent atrial fibrillation ablation: A systematic review

Anthony G. Brooks, PhD,\* Martin K. Stiles, MBChB, PhD,<sup>†</sup> Julien Laborderie, MD,\*  
Dennis H. Lau, MBBS,\* Pawel Kuklik, PhD,\* Nicholas J. Shipp, PhD,\* Li-Fern Hsu, MBBS,<sup>‡</sup>  
Prashanthan Sanders, MBBS, PhD\*

\*From the Cardiovascular Research Centre, Department of Cardiology, Royal Adelaide Hospital and the Disciplines of Medicine and Physiology, University of Adelaide, Adelaide, Australia, and <sup>†</sup>Department of Cardiology, Waikato Hospital, Hamilton and the University of Auckland, Auckland, New Zealand, and <sup>‡</sup>Department of Cardiology, National Heart Centre, Singapore.

Author	Year	N	Age (yr)	Disease type Enrollment criteria	Left atrial size (mm)	RF time	Procedure time (min)	Recurrence	Follow-up (months)	Primary success
Kanagaratnam	2001	71	57 ± 12	LSP Non-CV Confirmed 4-day Holter	42 ± 8	—	365	Ob	29 ± 8	0.21
Lim	2006	51	59 ± 10	P/LSP P AF >7 days LSP AF resistant to CV	45 ± 6	—	—	Sub	17 ± 9	0.22
Razavi	2006	28	58	LSP >6 months Non-CV	—	—	—	Sub	30 ± 11	0.54*
Yamada	2007	14	56 ± 9	LSP Non-CV	39 ± 4	—	—	Ob	—	0.21

\*Excluded from summary.

AF = atrial fibrillation; CV = cardioversion; LSP = long-standing persistent; Ob = objective; P/LSP = mixed persistent/long-standing persistent; PVI = pulmonary vein isolation; RF time = duration of radiofrequency ablation; Sub = subjective.

Objective monitoring includes holter, loop recorder, or transtelephonic recordings at defined intervals. Subjective monitoring includes clinical review, clinic ECG, symptom-driven investigation, or methods not specified.

Tek başına PVI ile LS PeAF 'de iki yıllık başarı yaklaşık %25 'dir  
Sadece PVI yapıldığında tekrar PVI uygulamaları ile başarı artmamaktadır.

# Persistan AF Ablasyonu

## PV Dışı Tetikleyiciler

- Vena Kava Superior
- LA Posterior Duvar
- Koroner Sinüs
- Marshall ligamenti
- Sol Atrial Apendiks

# Persistan AF Ablasyonu

PV dışı tetikleyicilerin yada substratın ablasyonu için;

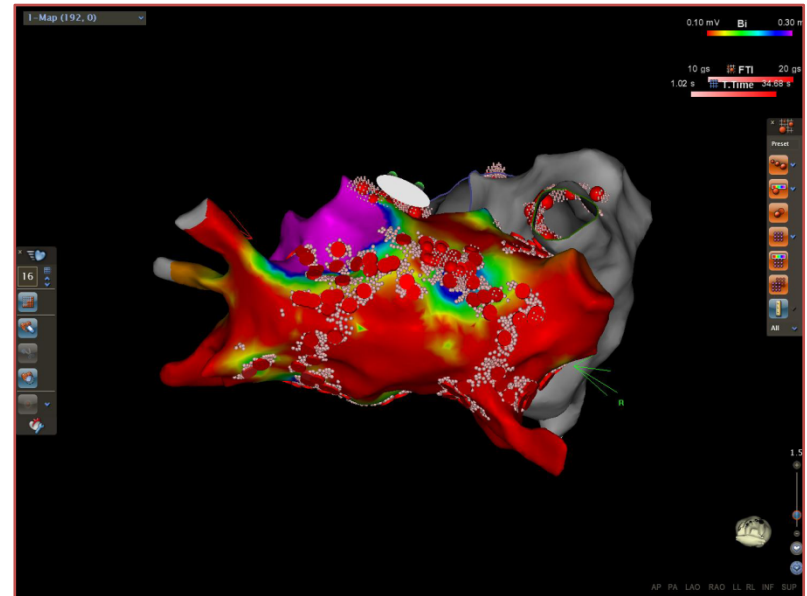
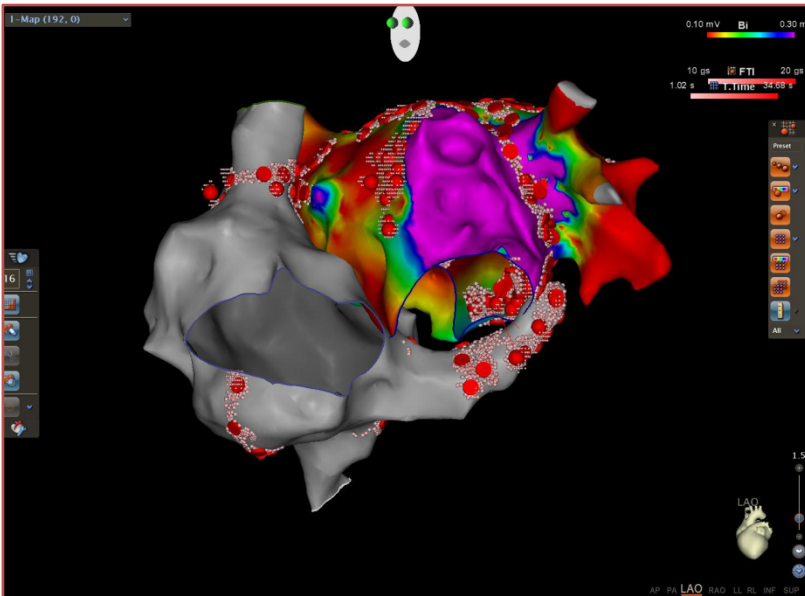
- Lineer Ablasyon
- Posterior Duvar Ablasyonu
- BIFA (Box Isolation of Fibrotic Areas)
- Rotor ablasyon
- Ganglion Pleksus Ablasyonu
- CFAE (Ablation of Complex Fractionated Atrial Electrograms)

gibi farklı ablasyon teknikleri geliştirilmiştir.

# Persistan AF /Linear Ablasyon

Lineer ablasyon stratejilerinin özellikle elektrofizyolojik lezyon bütünlüğü sağlandığında , substratı başarıyla değiştirdiği gösterilmiştir.

Ancak yapılan çalışmalarda , bu stratejinin uzun vadeli etkinliği konusunda çelişkili veriler vardır.



# Efficacy and Safety of Septal and Left-Atrial Linear Ablation for Atrial Fibrillation

Pierre Jaïs, MD, Dipen C. Shah, MD, Michel Haïssaguerre, MD, Atsushi Takahashi, MD, Thomas Lavergne, MD, Méléze Hocini, MD, Stéphane Garrigue, MD, Serge S. Barold, MD, Philippe Le Métayer, MD, and Jacques Clémenty

Atrial fibrillation (AF), the most common of all sustained cardiac arrhythmias, is frequently resistant to antiarrhythmic drugs, and physicians have seen limited success with catheter ablation limited to the right atrium. As a result, the safety and efficacy of systematic biatrial linear ablation for drug resistant AF was investigated. Forty-four patients ( $54 \pm 7$  years) underwent catheter ablation of daily drug-resistant AF. Two right-atrial lines (1 septal and 1 cavotricuspid) and 3–4 left-atrial lines were transeptally performed: 2 joining each superior pulmonary vein to the posterior mitral annulus and 1 interconnecting them. An additional left-atrial septal line from the right superior pulmonary vein (RSPV) to the foramen ovalis was performed in 23 patients. Radiofrequency was delivered with a conventional thermocouple-equipped ablation catheter or with an irrigated tip ablation catheter for resistant cases and for sparing the

endocardium. Of the 44 patients, 25 (57%) were successfully treated without antiarrhythmic drugs. Twelve patients (27%) improved (<6 hours of AF per trimester under a previously ineffective drug) and 7 (16%) were considered treatment failures. Multiple sessions were required to ablate new left-atrial macro-reentry and initiating foci ( $2.7 \pm 1.3$  procedures per patient). Five patients had a pericardial effusion and 1 each a pulmonary embolism, an inferior myocardial infarction, and a reversible cerebral ischemic event. One patient had thrombosis of the 2 left pulmonary veins. Despite a relatively high success rate, this procedure is too long, and the safety and efficacy need to be improved and applied to a broader range of patients. ©1999 by Excerpta Medica, Inc.

Am J Cardiol 1999;84:139R–146R

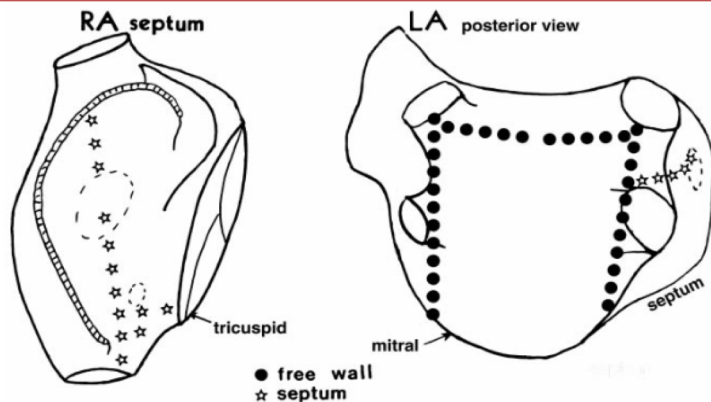


FIGURE 1. Ablation scheme—Right atrium: The septal line begins from the superior vena cava and extends to the inferior vena cava via the fossa ovalis. The cavotricuspid line was performed to prevent common flutter. Left atrium: 2 vertical lines join the os of the 2 superior pulmonary veins to the mitral annulus and 1 horizontal line interconnects them. An optional septal line from the right superior pulmonary vein (RSPV)–Mitral line to the fossa ovalis was performed in 23 patients.

TABLE I Variables of Successful Outcome of Atrial Fibrillation Ablation

	Success Without Treatment (n = 25)	Success With Treatment (n = 12)	Failures (n = 7)	Total
Focus ablated	13	7	0	20
≥1 complete line of block	14	4	0	18
Sex				
Female	1	2	3	6
Male	24	10	4	38
Weight (kg)	83.1 ± 8.1	84.5 ± 14	88.6 ± 20	
No. of procedures	2.8 ± 1.3	3 ± 1.1	2 ± 0.8	2.7 ± 1.3
Structural heart disease	4	2	5	
Longitudinal LA dimensions (mm)	52 ± 6.9	53.8 ± 8.7	58.4 ± 6.3	
Transverse LA dimensions (mm)	39.1 ± 5.3	39.3 ± 5	41.9 ± 6	
Longitudinal RA dimensions (mm)	47.7 ± 5.3	50.7 ± 7.8	50.7 ± 8.5	
Transverse RA dimensions (mm)	39.2 ± 7.5	41 ± 6.8	36.1 ± 4.7	

LA = left atrial; RA = right atrial.

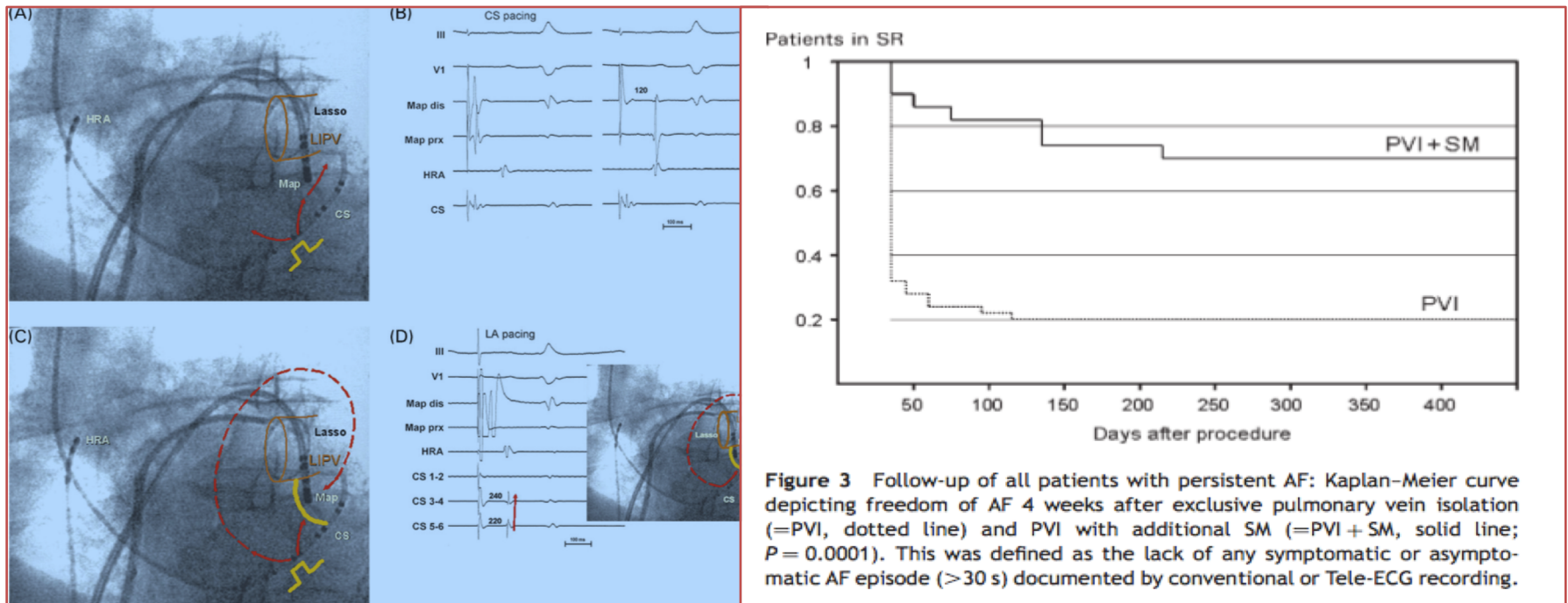


# Substrate modification combined with pulmonary vein isolation improves outcome of catheter ablation in patients with persistent atrial fibrillation: a prospective randomized comparison<sup>†</sup>

Stephan Willems\*, Hanno Klemm, Thomas Rostock, Benedikt Brandstrup, Rodolfo Ventura, Daniel Steven, Tim Risius, Boris Lutomsky, and Thomas Meinertz

Department of Cardiology, University Hospital Eppendorf, Martinistr. 52, D-20246 Hamburg, Germany

Received 31 October 2005; revised 17 May 2006; accepted 26 May 2006; online publish-ahead-of-print 16 June 2006



# Circumferential Pulmonary Vein Ablation With Additional Linear Ablation Results in an Increased Incidence of Left Atrial Flutter Compared With Segmental Pulmonary Vein Isolation as an Initial Approach to Ablation of Paroxysmal Atrial Fibrillation

Navinder Sawhney, MD; Ramtin Anousheh, MD, MPH; Wei Chen, MPH; Gregory K. Feld, MD

**Background**—There has been growing concern that linear ablation is associated with an increased risk of iatrogenic arrhythmias in patients undergoing ablation for atrial fibrillation (AF). Therefore, we compared circumferential pulmonary vein ablation plus left atrial linear ablation (CPVA+LALA) with segmental pulmonary vein isolation (PVI) in patients with paroxysmal AF.

**Methods and Results**—Sixty-six consecutive patients with paroxysmal AF were prospectively randomly assigned to receive PVI versus CPVA+LALA (consisting of encircling lesions around the pulmonary veins), a roof line, and a mitral isthmus line with documentation of bidirectional mitral isthmus block. All patients were seen at 1, 3, 6, and every 12 months after ablation, with 14-day continuous ECG monitoring every 6 months. At  $16.4 \pm 6.3$  months after 1 ablation procedure, 19 patients (58%) remained free of atrial arrhythmias after PVI versus 17 patients (51%) after CPVA+LALA ( $P=0.62$ ). After PVI, 14 patients had recurrent paroxysmal AF, whereas after CPVA+LALA, 8 patients had recurrent AF, 6 had atypical left atrial flutter (LAFL), and 2 had both AF and LAFL ( $P=0.32$  between PVI versus CPVA+LALA for AF but  $P=0.002$  for LAFL). Twenty-eight patients (85%) remained arrhythmia-free after  $1.3 \pm 0.5$  PVI procedures versus 28 patients (85%) after  $1.4 \pm 0.6$  CPVA+LALA procedures ( $P=NS$ ). Fluoroscopy time was longer after CPVA+LALA versus PVI (91 versus 73 minutes,  $P=0.04$ ).

**Conclusions**—As an initial ablation approach in patients with paroxysmal AF, more LAFL occurred after CPVA+LALA and fluoroscopy times were longer compared with segmental PVI. (*Circ Arrhythm Electrophysiol.* 2010;3:243-248.)

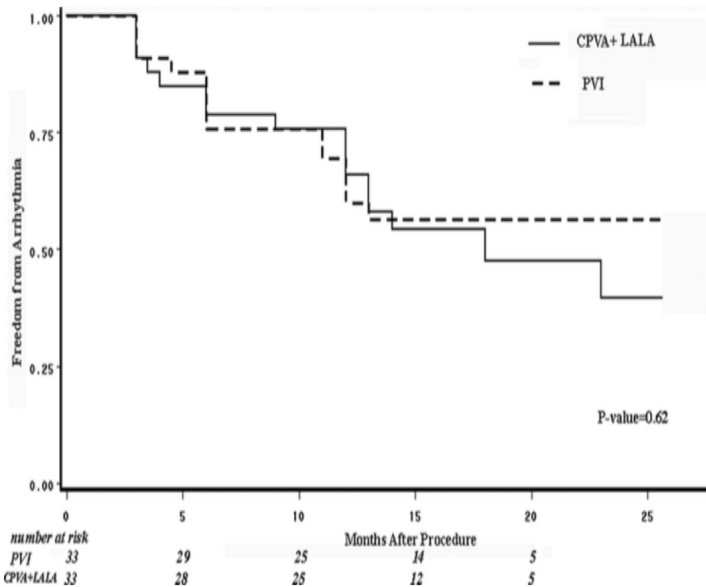


Figure 3. Kaplan-Meier curve showing the probability of recurrence of any atrial arrhythmia after 1 ablation procedure between the 2 groups.

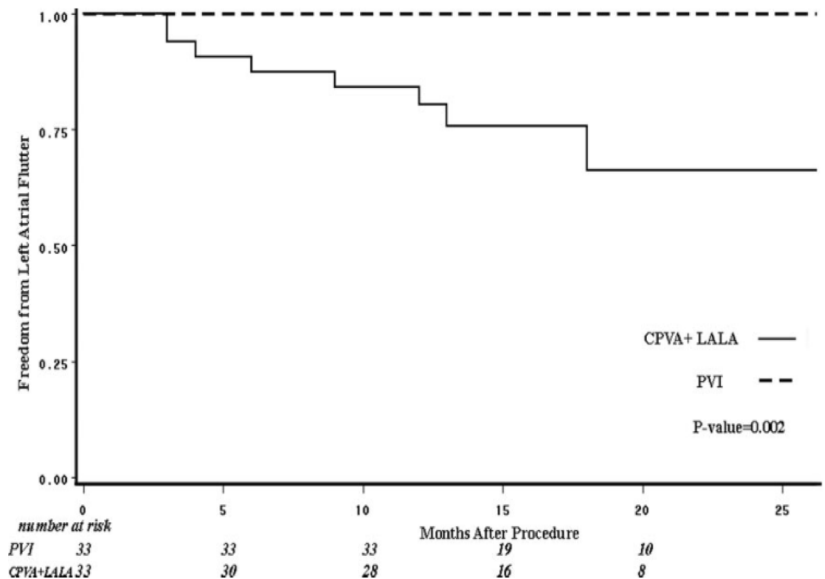
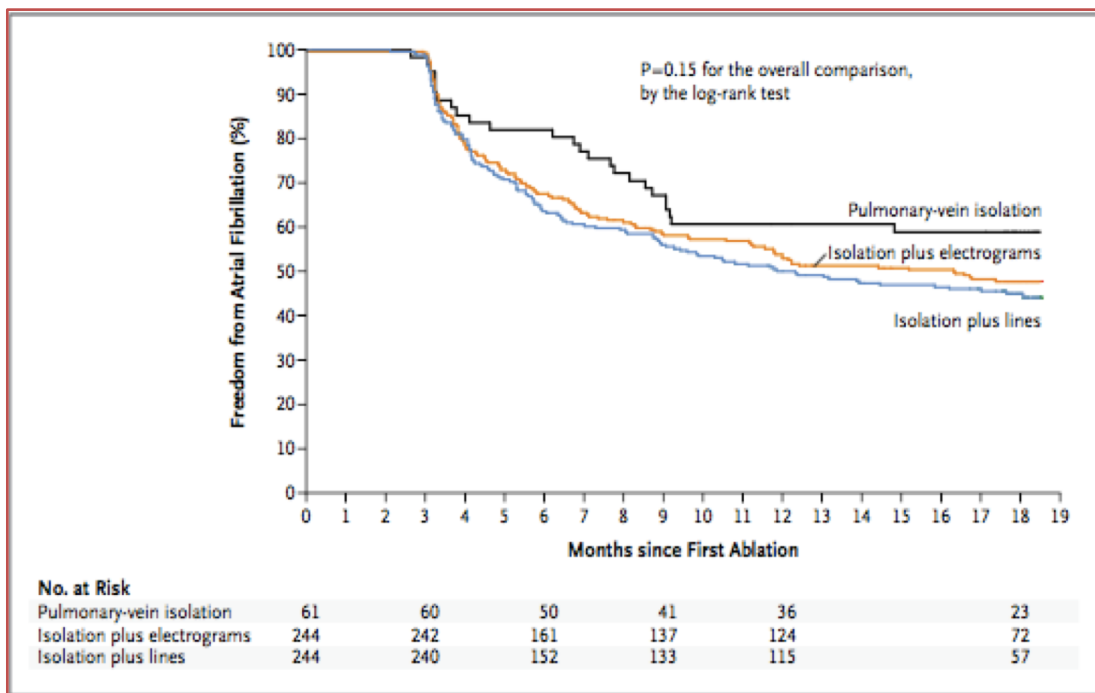
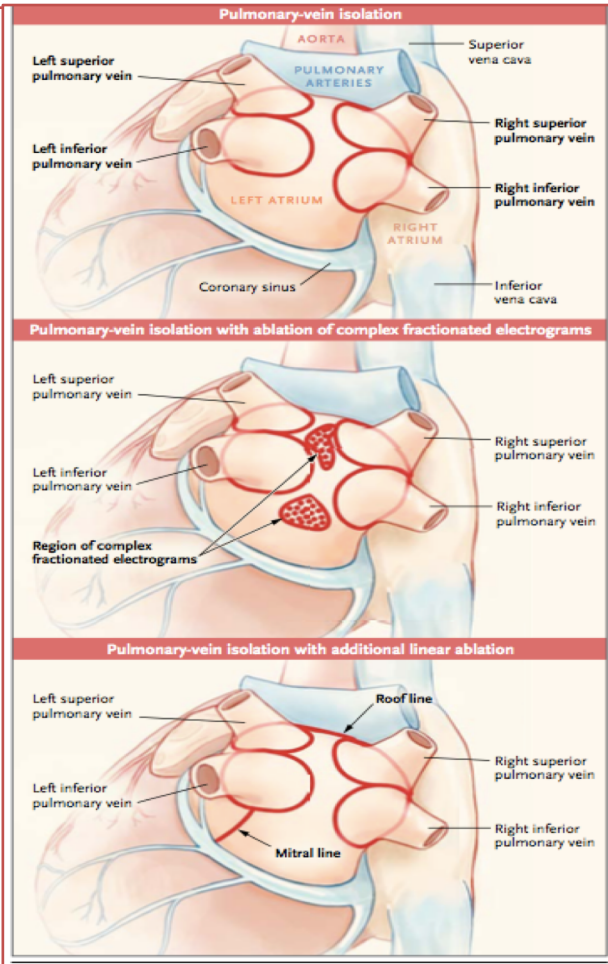


Figure 4. Kaplan-Meier curve showing the probability of developing LAFL between the 2 groups.

# Approaches to Catheter Ablation for Persistent Atrial Fibrillation

Atul Verma, M.D., Chen-yang Jiang, M.D., Timothy R. Betts, M.D., M.B., Ch.B., Jian Chen, M.D., Isabel Deisenhofer, M.D., Roberto Mantovan, M.D., Ph.D., Laurent Macle, M.D., Carlos A. Morillo, M.D., Wilhelm Haverkamp, M.D., Ph.D., Rukshen Weerasooriya, M.D., Jean-Paul Albenque, M.D., Stefano Nardi, M.D., Endrj Menardi, M.D., Paul Novak, M.D., and Prashanthan Sanders, M.B., B.S., Ph.D., for the STAR AF II Investigators\*

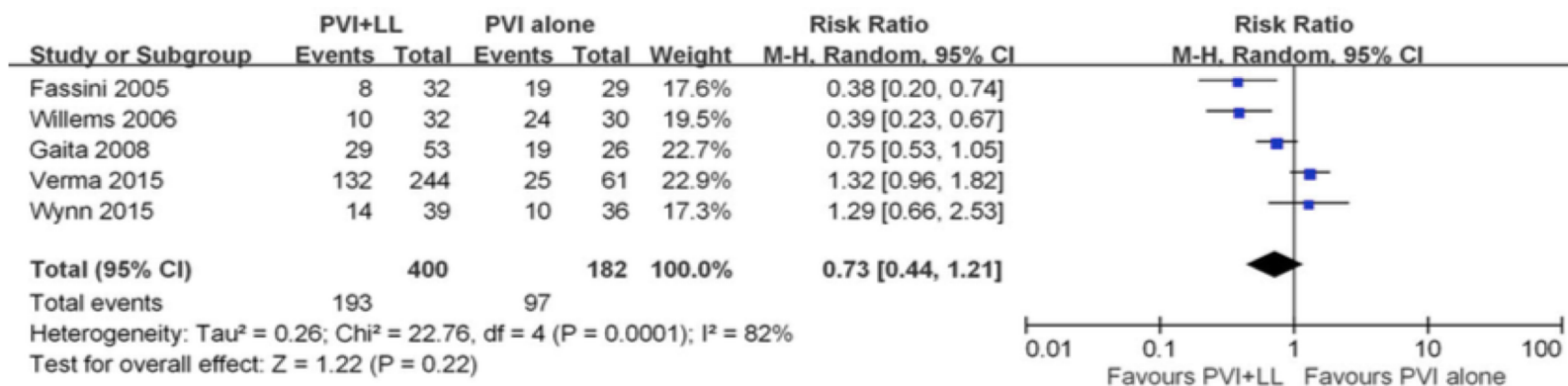


## REVIEW

# Linear Ablation Following Pulmonary Vein Isolation in Patients with Atrial Fibrillation: A Meta-Analysis

ZHIWEI ZHANG, B.S.,\* KONSTANTINOS P. LETSAS, M.D.,† NIXIAO ZHANG, B.S.,\* MICHAEL EFREMIDIS, M.D.,† GANG XU, M.D., PH.D.,\* GUANGPING LI, M.D., PH.D.,\* and TONG LIU, M.D., PH.D.\*

From the \*Tianjin Key Laboratory of Ionic-Molecular Function of Cardiovascular Disease, Department of Cardiology, Tianjin Institute of Cardiology, Second Hospital of Tianjin Medical University, Tianjin, People's Republic of China; and †Second Department of Cardiology, Laboratory of Cardiac Electrophysiology, "Evangelismos" General Hospital of Athens, Athens, Greece



**Figure 2.** Forest plot comparing PVI plus additional LL with PVI alone in PeAF patients. CI = confidence interval. Other abbreviations as in Figure 1.

Dichotomous	Study (n)	RR (95% CI)	P-Value	I <sup>2</sup> (%)
Total complication	7	0.93 (0.54, 1.61)	0.80	0
Continuous	Study (n)	MD (95% CI)	P-value	I <sup>2</sup> (%)
RF time	7	18.63 (8.86, 28.40)	0.0002	95
Fluoroscopy time	7	6.97 (4.18, 9.75)	<0.00001	51
Procedure time	7	23.61 (12.56, 34.67)	<0.0001	84

CI = confidence interval; MD = mean difference; RF = radiofrequency; RR = relative risk. Other abbreviations as in Table 1.




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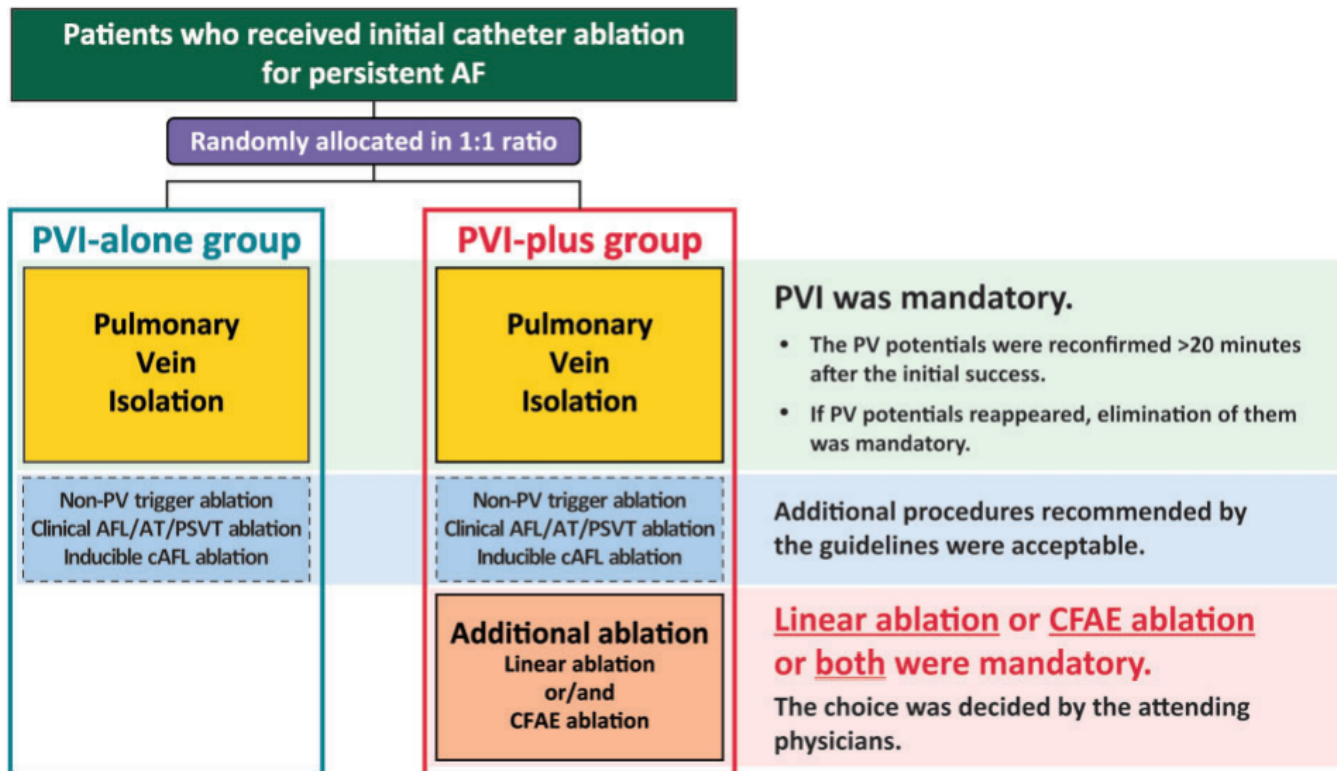
Europace (2020) 00, 1–10  
doi:10.1093/europace/euaa293

CLINICAL RESEARCH

# Pulmonary vein isolation alone vs. more extensive ablation with defragmentation and linear ablation of persistent atrial fibrillation: the EARNEST-PVI trial

**Koichi Inoue <sup>1\*</sup>, Shungo Hikoso<sup>1</sup>, Masaharu Masuda<sup>2</sup>, Yoshio Furukawa<sup>3</sup>, Akio Hirata<sup>4</sup>, Yasuyuki Egami<sup>5</sup>, Tetsuya Watanabe<sup>6</sup>, Hitoshi Minamiguchi<sup>1</sup>, Miwa Miyoshi<sup>7</sup>, Nobuaki Tanaka<sup>1</sup>, Takafumi Oka<sup>1</sup>, Masato Okada<sup>1</sup>, Takashi Kanda<sup>2</sup>, Yasuhiro Matsuda<sup>2</sup>, Masato Kawasaki<sup>3</sup>, Kenichi Hayashi<sup>8</sup>, Tetsuhisa Kitamura<sup>10</sup>, Tomoharu Dohi<sup>1</sup>, Akihiro Sunaga<sup>1</sup>, Hiroya Mizuno<sup>1</sup>, Daisaku Nakatani<sup>1</sup>, and Yasushi Sakata<sup>1</sup>; on behalf of the OCVC Arrhythmia Investigators**

<sup>1</sup>Cardiovascular Center, Sakurabashi-Watanabe Hospital, 2-4-32 Umeda, Kita-ku, Osaka 530-0001, Japan; <sup>2</sup>Department of Cardiovascular Medicine, Osaka University Graduate School of Medicine, Suita, Japan; <sup>3</sup>Cardiovascular Center, Kansai Rosai Hospital, Amagasaki, Japan; <sup>4</sup>Division of Cardiology, Osaka General Medical Center, Osaka, Japan; <sup>5</sup>Cardiovascular Division, Osaka Police Hospital, Osaka, Japan; <sup>6</sup>Division of Cardiology, Osaka Rosai Hospital, Sakai, Japan; <sup>7</sup>Department of Cardiovascular Medicine, Yao Municipal Hospital, Yao, Japan; <sup>8</sup>Department of Cardiology, Osaka Hospital, Japan Community Healthcare Organization, Osaka, Japan; <sup>9</sup>Department of Mathematics, Keio University, Yokohama, Japan; and <sup>10</sup>Division of Environmental Medicine and Population Sciences, Department of Social and Environmental Medicine, Osaka University Graduate School of Medicine, Suita, Japan

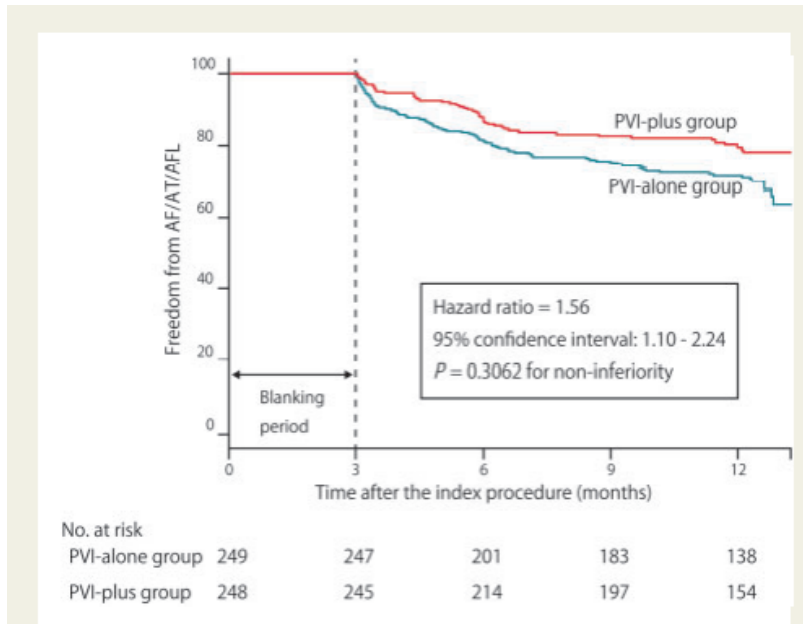


**Figure 1** Schema of the EARNEST-PVI trial. Patients with persistent atrial fibrillation (AF) were randomized to the PVI-plus group or PVI-alone group. AFL, atrial flutter, AT, atrial tachycardia; cAFL, common AFL; CFAE, complex fractionated electrogram; PSVT, supraventricular tachycardia; PVI, pulmonary vein isolation.

**Table 2** Procedural characteristics

Variables	PVI alone, n = 249	PVI plus additional ablation, n = 248	P-value
PVI under sinus rhythm, n (%)	61 (24.5)	58 (22.8)	0.7717
Successful PVI, n (%)	248 (99.6)	248 (100)	>0.9999
Three-dimensional mapping system, n (%)	248 (99.6)	248 (100)	>0.9999
CARTO, n (%)	232/248 (93.5)	228/248 (91.9)	0.6042
Ensite, n (%)	13/248 (5.2)	14/248 (5.6)	>0.9999
Rhythmia, n (%)	3/248 (1.2)	7/248 (2.8)	0.3387
Contact force sensing catheter, n (%)	232 (93.2)	229 (92.3)	0.7330
Deflectable sheath, n (%)	95 (38.2)	118 (47.6)	0.0372
CFAE ablation, n (%)	0 (0)	38 (15.3)	<0.0001
Linear ablation, n (%)	0 (0)	211 (85.1)	<0.0001
Ganglionated plexus ablation, n (%)	0 (0)	2 (0.8)	0.2485
CTI ablation, n (%)	68 (27.3)	74 (29.8)	0.5524
CTI block achieved, n (%)	67/68 (98.5)	71/74 (95.9)	0.7456
SVC isolation, n (%)	7 (2.8)	6 (2.4)	>0.9999
Successful SVC isolation, n (%)	7/7 (100)	5/6 (83.3)	0.4615
Non-PV trigger, n (%)	23 (9.3)	9 (3.6)	0.0163
Elimination of all non-PV trigger, n (%)	11/23 (47.8)	5/9 (55.6)	>0.9999
Number of non-PV trigger per patient	1 (1–2)	1 (1–2)	0.886
Procedure time (min)	145 (112–175)	180 (135–230)	<0.001
Total duration of energy application (s)	1895 (1405–2507)	2913 (2326–3705)	<0.0001
Total energy delivery (J)	56 210 (41 881–79 022)	88 140 (66 945–117 362)	<0.0001
Fluoroscopy time (min)	22.1 (16.3–33.99)	31.0 (19.5–42.7)	<0.001

CFAE, complex fractionated atrial electrogram; CTI, cavotricuspid isthmus; PV, pulmonary vein; PVI, pulmonary vein isolation; SVC, superior vena cava.



**Figure 3** Freedom from the primary endpoint. The graph shows the Kaplan–Meier estimates of the freedom from the primary endpoint. The non-inferiority of PVI alone compared with PVI plus additional ablation could not be shown [hazard ratio = 1.56 (95% confidence interval: 1.10–2.24), non-inferior  $P = 0.3062$ ]. PVI, pulmonary vein isolation.

### Methods and results

Patients with persistent AF who underwent an initial catheter ablation ( $n = 512$ , long-standing persistent AF; 128 cases) were randomly assigned in a 1:1 ratio to either PVI alone (PVI-alone group) or PVI plus CFAE and/or linear ablation (PVI-plus group). After excluding 15 cases who did not receive procedures, we analysed 249 and 248 patients, respectively. The primary endpoint was recurrence of AF, atrial flutter, and/or atrial tachycardia, and the non-inferior margin was set at a hazard ratio of 1.43. In the PVI-plus group, 85.1% of patients had linear ablation and 15.3% CFAE ablation. After 12 months, freedom from the primary endpoint occurred in 71.3% of patients in the PVI-alone group and in 78.3% in the PVI-plus group [hazard ratio = 1.56 (95% confidence interval: 1.10–2.24), non-inferior  $P = 0.3062$ ]. The procedure-related complication rates were 2.0% in the PVI-alone group and 3.6% in the PVI-plus group ( $P = 0.199$ ).





# Comparison of the empirical linear ablation and low voltage area-guided ablation in addition to pulmonary vein isolation in patients with persistent atrial fibrillation: a propensity score-matched analysis

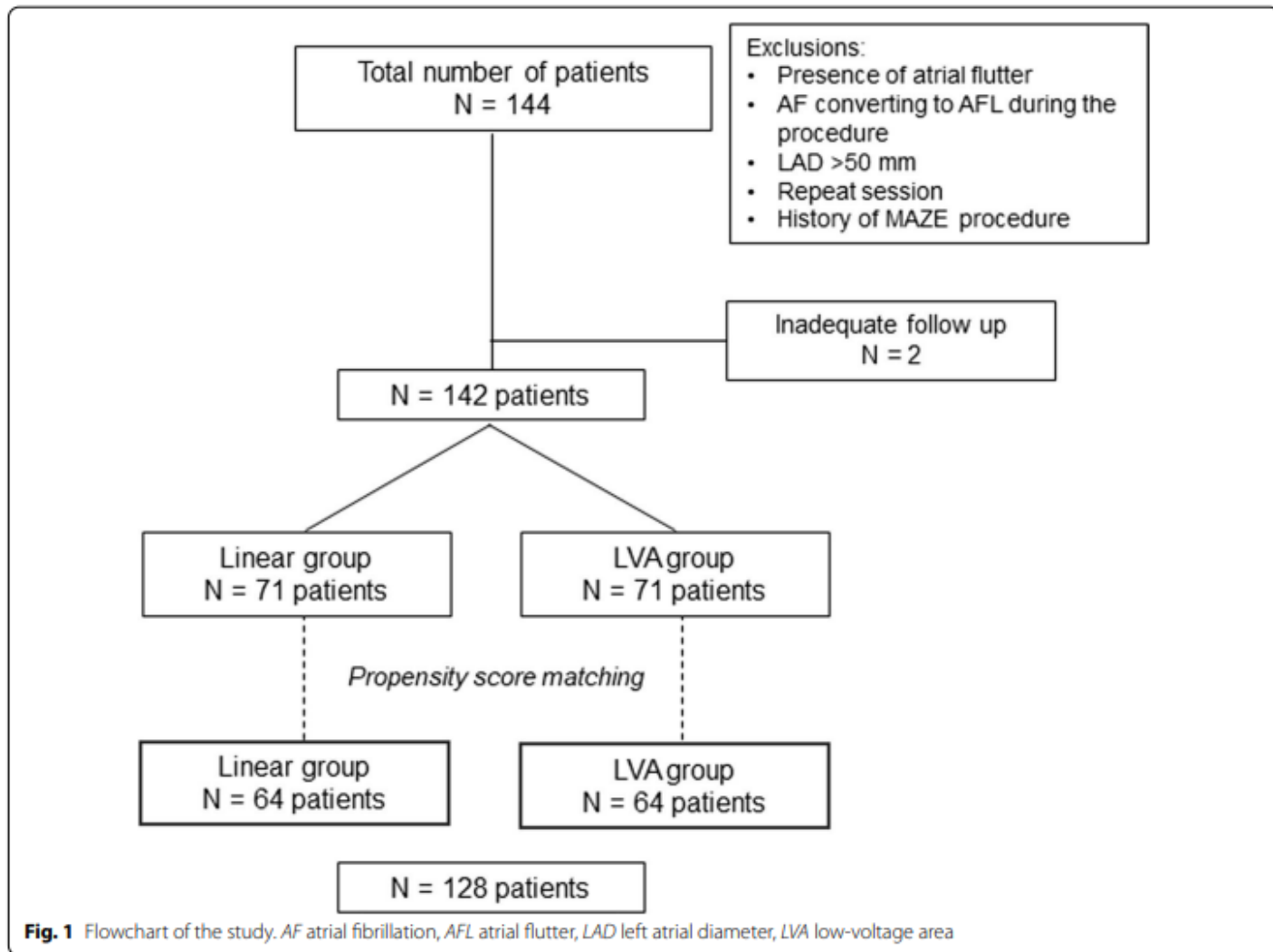
Noriyuki Suzuki<sup>1,2</sup>, Shinji Kaneko<sup>1</sup>, Masaya Fujita<sup>1</sup>, Masanori Shinoda<sup>1</sup>, Ryuji Kubota<sup>1</sup>, Taiki Ohashi<sup>1</sup>, Yosuke Tatami<sup>1</sup>, Junya Suzuki<sup>1</sup>, Hitomi Hori<sup>1</sup>, Kentaro Adachi<sup>1</sup>, Ryota Ito<sup>1</sup>, Yoshinori Shirai<sup>1</sup>, Satoshi Yanagisawa<sup>2\*</sup>, Yasuya Inden<sup>2</sup> and Toyoaki Murohara<sup>2</sup>

## Abstract

**Background:** The efficacy of pulmonary vein isolation (PVI) alone is not guaranteed for persistent atrial fibrillation (PeAF), and it is unclear which type of ablation approach should be applied in addition to PVI. This study aimed to compare outcomes and prognosis between empirical linear ablation and low-voltage area (LVA) ablation after PVI for PeAF.

**Methods:** We enrolled 128 patients with PeAF who were assigned to the linear ablation group (n = 64) and the LVA ablation group (n = 64) using a propensity score-matched model. After PVI and cardioversion, the patients underwent either empirical linear ablation or LVA ablation during sinus rhythm. All patients in the linear ablation group underwent both roof line and mitral valve isthmus (MVI) ablations. An electrical-guided ablation targeting LVA (< 0.5 mV) was performed in the LVA group. When there was no LVA in the LVA group, only PVI was applied. We compared the procedural outcomes and recurrence after ablation between the two groups.

**Results:** The baseline characteristics were well-balanced between the two groups. Fifty patients had LVA (22 and 28 patients in the linear and LVA groups). The roof and MVI lines were completed in 100% and 96.9% of the patients. During the mean follow-up of  $279.5 \pm 161.3$  days, the LVA group had significantly lower recurrence than the linear group (15 patients [23%] vs. 29 patients [45%],  $p = 0.014$ ). Thirty-five patients were prescribed antiarrhythmic drugs during the follow-up period (linear group, n = 17; LVA group, n = 18); amiodarone and bepridil were administered to most of the patients (15 and 17 patients, respectively). The difference in the prognosis was relevant among the patients with LVA, while this trend was not observed in those without LVA. The LVA ablation group demonstrated significantly lower radiofrequency energy and shorter procedural time compared to the linear ablation group. The recurrence of atrial flutter was more likely to occur in the linear group than in the LVA group (14 [22%] vs. 6 [9.4%],  $p = 0.052$ ).

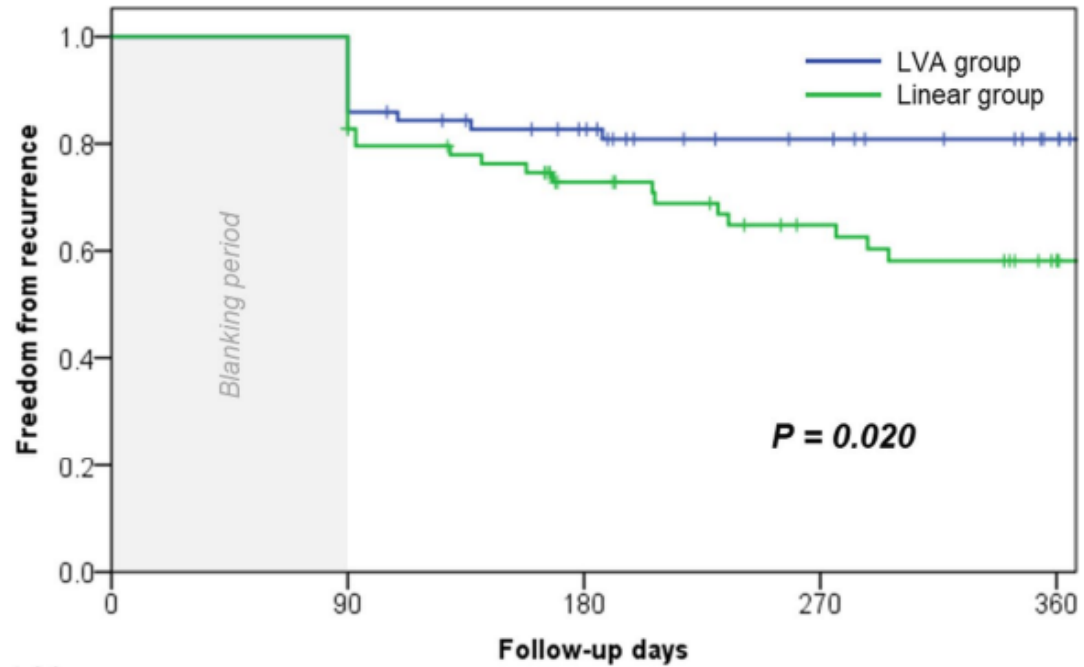


**Fig. 1** Flowchart of the study. AF atrial fibrillation, AFL atrial flutter, LAD left atrial diameter, LVA low-voltage area

**Table 2** Comparison of procedure results between the linear and LVA groups after propensity score matching analysis

	Linear group (n = 64)	LVA group (n = 64)	p value
Pulmonary vein isolation	64 (100)	64 (100)	n/a
CTI block line	64 (100)	64 (100)	n/a
Roof line	64 (100)	n/a	
MVI line	62 (96.9)	n/a	
LVA (cm <sup>2</sup> )	7.1 ± 18.0	10.1 ± 16.2	0.322
Patients with LVA (%)	22 (34.4)	28 (43.8)	0.365
LA area (cm <sup>2</sup> )	121.9 ± 32.1	113.6 ± 41.1	0.224
LVA/LA (%)	6.6 ± 1.6	10.4 ± 2.5	0.345
Contact force-sensing catheter			
RF (J)	103,972 ± 33,190	81,318 ± 27,200	<0.001
Procedural time (h)	2.6 ± 0.6	2.3 ± 0.6	<0.001
Fluoroscopy time (min)	55.6 ± 20.8	53.4 ± 56.0	0.771
Fluoroscopy dose (mGy)	399.2 ± 596.0	487.4 ± 1586.1	0.684
Major complications (%)	0 (0)	0 (0)	n/a

CTI cavotricuspid isthmus, LA left atrium, LVA low voltage area, MVI mitral valve isthmus, RF radiofrequency. Data are presented as mean ± standard deviation or number (percentage)



**Fig. 4** Kaplan–Meier event-free survival curves of recurrence-free rate after ablation between the linear and LVA groups. LVA low voltage area

# Atrial Fibrilasyon Katater Ablasyonu

Techniques and technologies	
Complete electrical isolation of the pulmonary veins is recommended during all AF catheter-ablation procedures. <a href="#">235–237,239,606,608–610,613,614,678,679,681,683,684,686,713,731,759,780</a>	I
If patient has history of CTI-dependent AFL or if typical AFL is induced at the time of AF ablation, delivery of a CTI lesion may be considered. <a href="#">731–733,819–821</a>	IIb
Use of additional ablation lesions beyond PVI (low voltage areas, lines, fragmented activity, ectopic foci, rotors, and others) may be considered but is not well established. <a href="#">677,680,708,711–730</a>	IIb

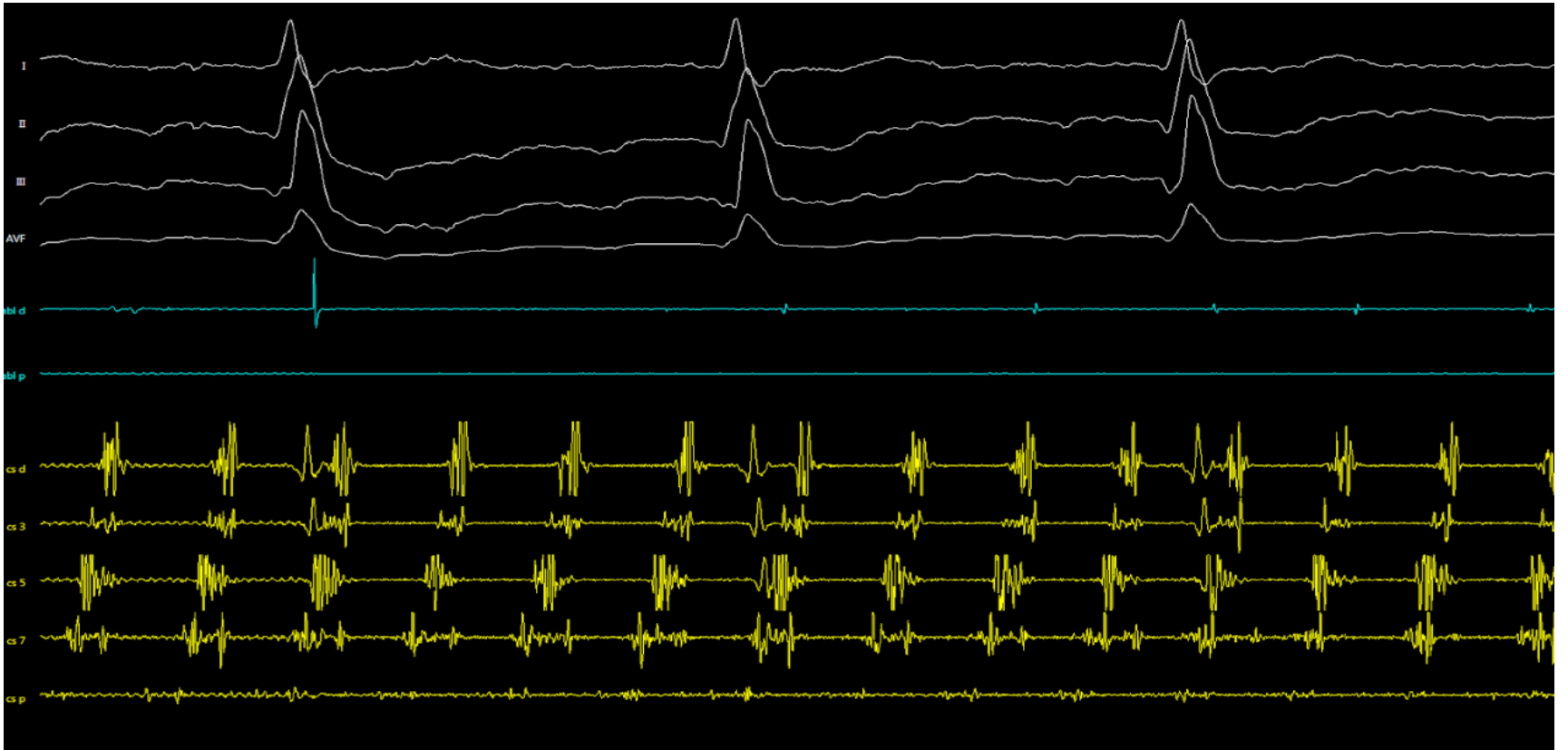
# Persistan AF /Linear Ablasyon

**Table 3** Atrial fibrillation ablation: strategies, techniques, and endpoints

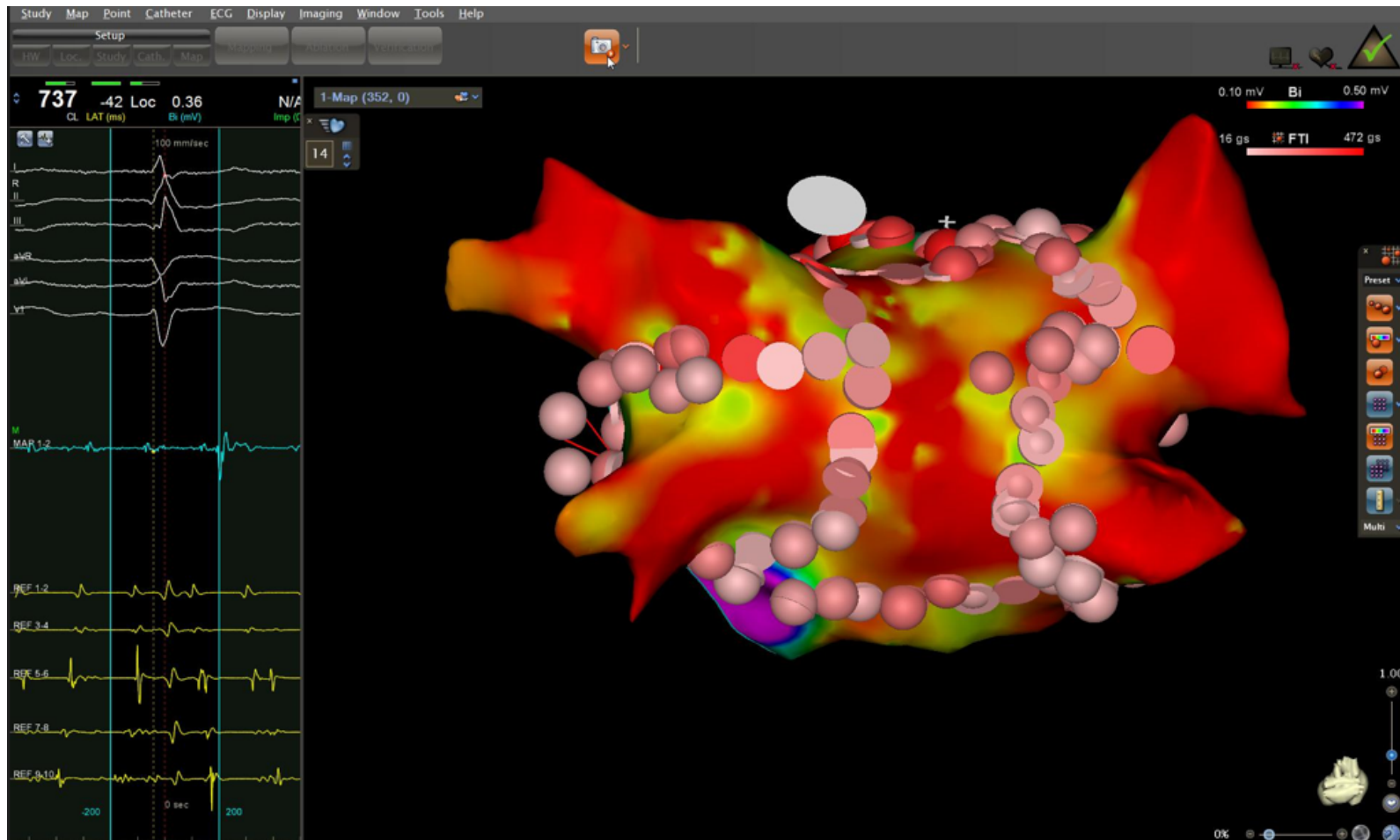
	Recommendation	Class	LOE
PV isolation by catheter ablation	Electrical isolation of the PVs is recommended during all AF ablation procedures.	I	A
	Achievement of electrical isolation requires, at a minimum, assessment and demonstration of entrance block into the PV.	I	B-R
Ablation strategies to be considered for use in conjunction with PV isolation	If a patient has a history of typical atrial flutter or typical atrial flutter is induced at the time of AF ablation, delivery of a cavotricuspid isthmus linear lesion is recommended.	I	B-R
	If linear ablation lesions are applied, operators should use mapping and pacing maneuvers to assess for line completeness.	I	C-LD
	The usefulness of creating linear ablation lesions in the right or left atrium as an initial or repeat ablation strategy for persistent or long-standing persistent AF is not well established.	IIb	B-NR

# Olgu

77 yaş kadın hasta, taşikardiyomiyopati, EF % 30-35, LA 52 mm

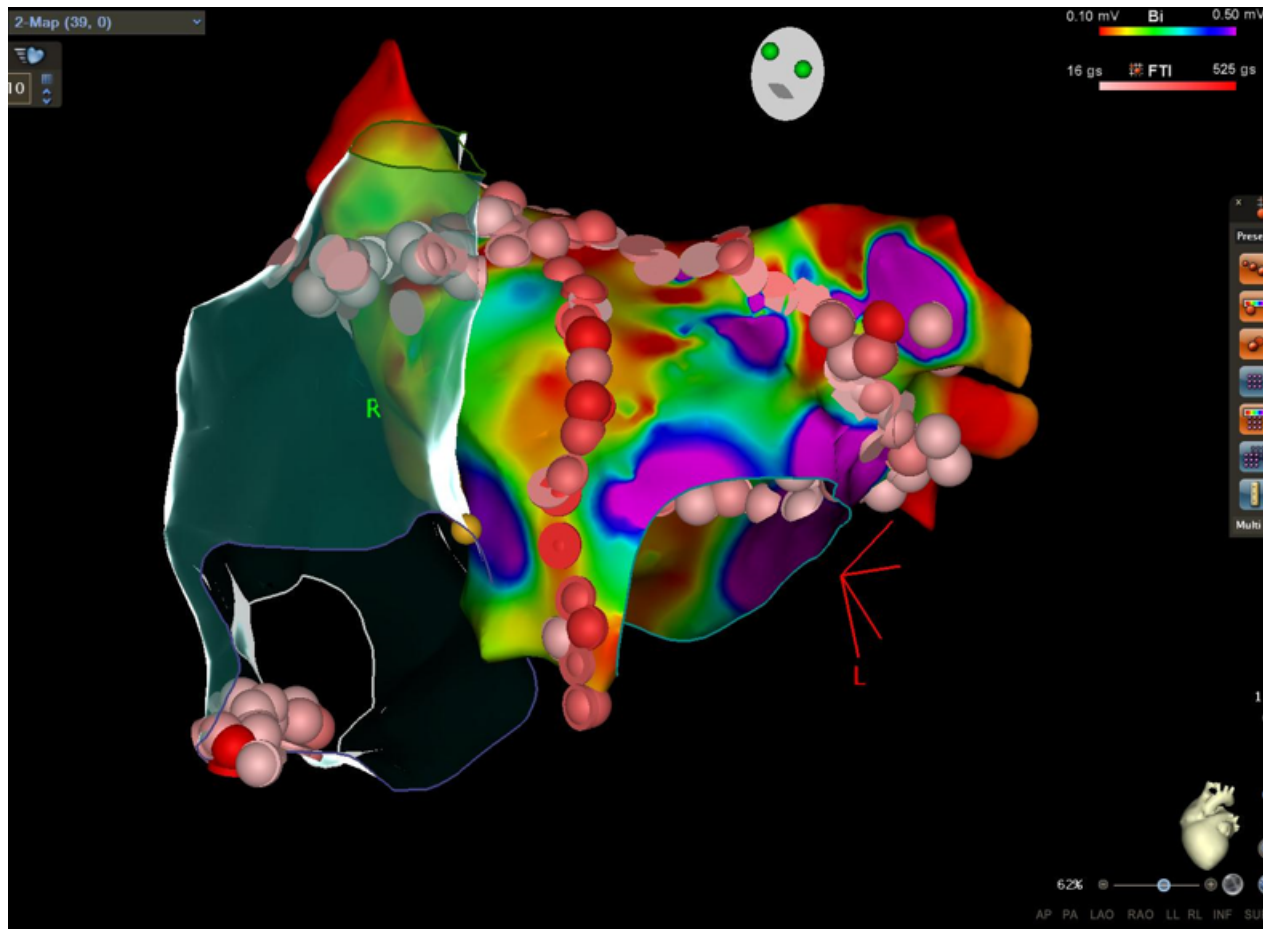


# LA Voltaj Haritalama

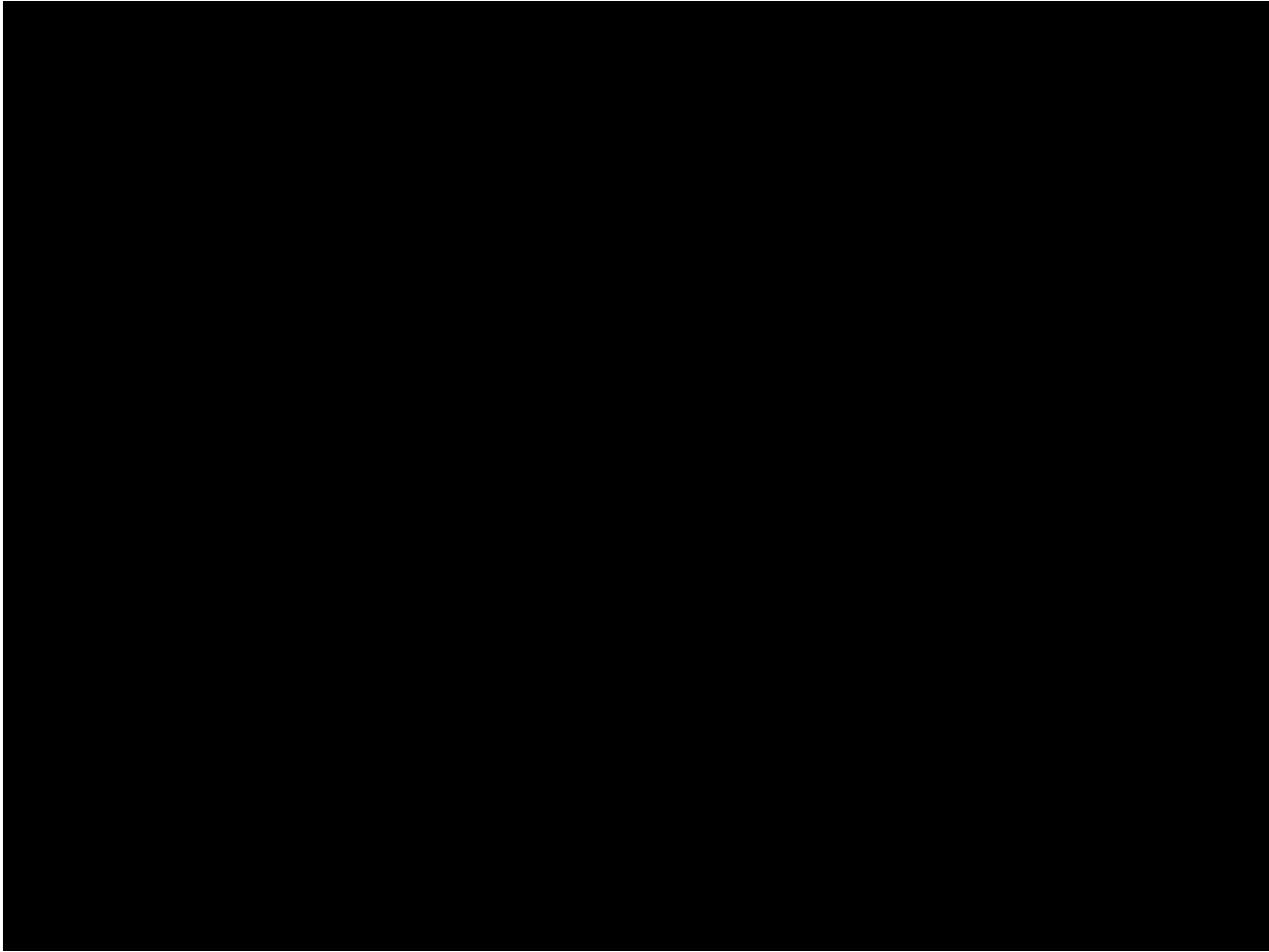


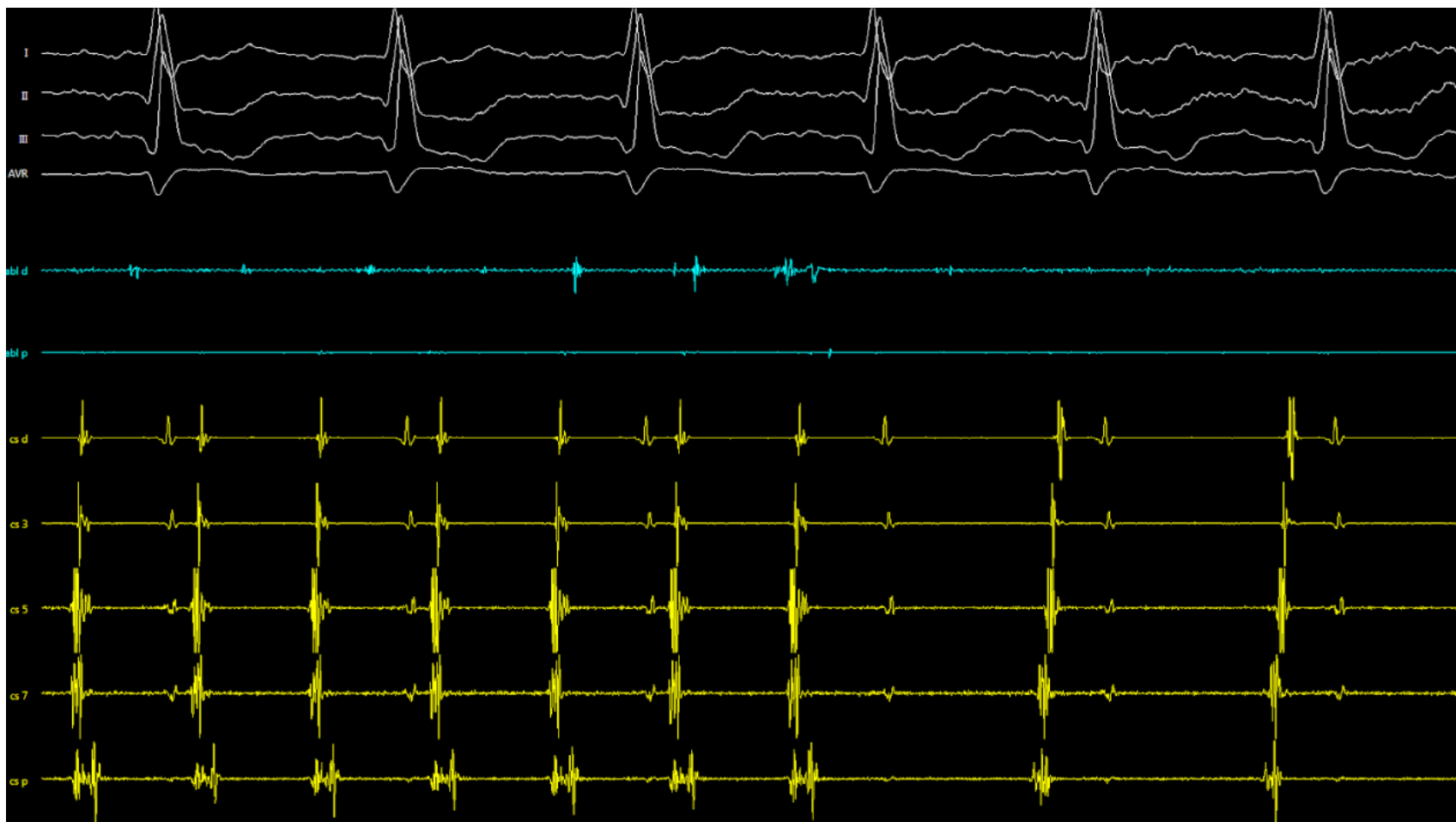


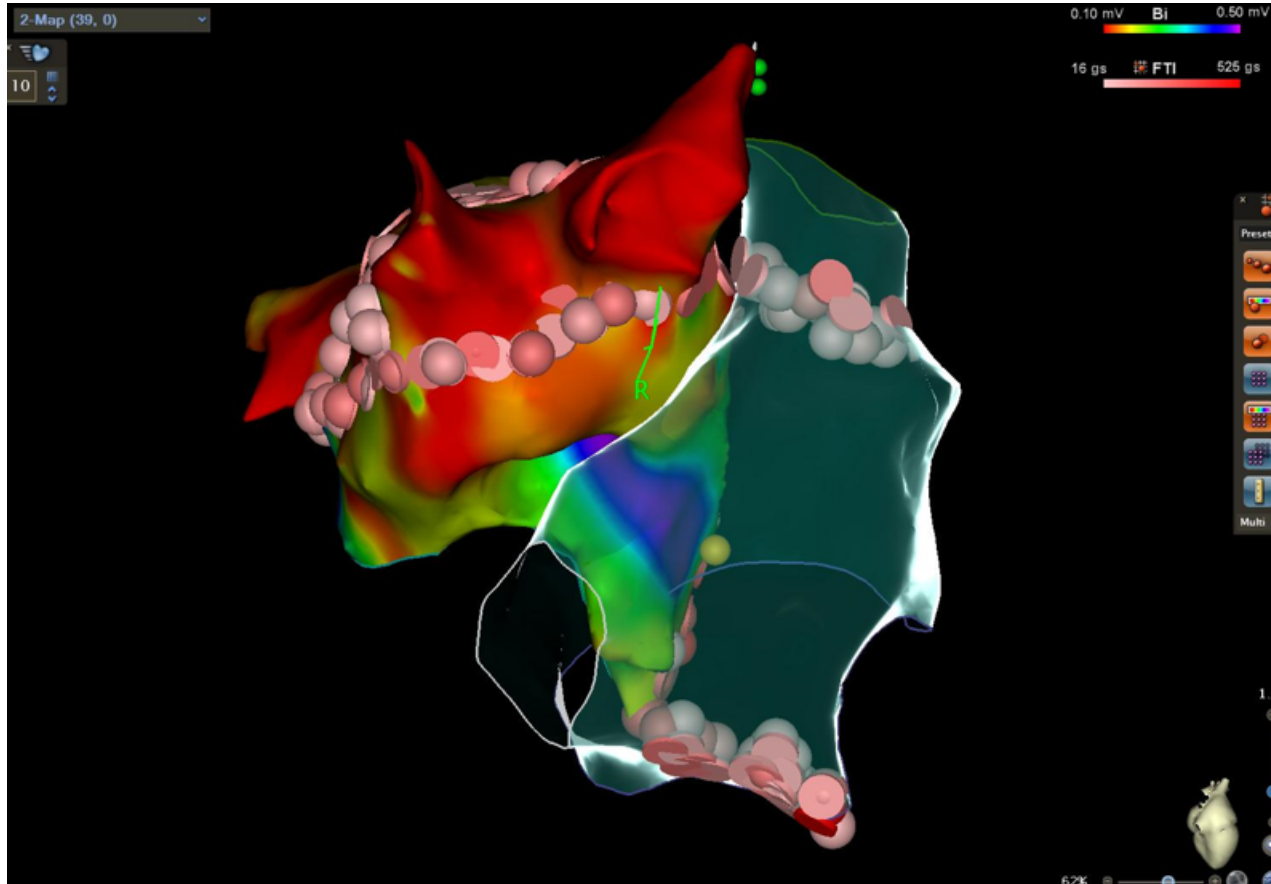
# LA Voltaj Haritalama











# Sonuç

Persistan AF'de en uygun ablasyon yaklaşımı belirsizliğini koruyor.

Daha fazla ablasyon = Başarı ?

Prosedür sırasında belgelenmiş AFL olmayan vakalarda, eksik bir lineer ablasyon hattı olasılığı ve artan AF ve AFL nüksü riski nedeniyle ampirik lineer ablyasyondan kaçınmak daha iyi olabilir.

Teşekkürler.....