Persistan AF ablasyonunda cryobalon kullanılmamalıdır

Prof. Dr. Fethi KILIÇASLAN
Medipol Üniversitesi

Scientific competition is different from an athletics race. There may, and should, be more than one winner

EDITORIAL COMMENT

Long-Standing Persistent Atrial Fibrillation

The Metastatic Cancer of Electrophysiology*

J. David Burkhardt, MD,†
Luigi Di Biase, MD, PhD,†‡§
Andrea Natale, MD†§

Austin, Texas; and Foggia, Italy

Persistan AF ablasyonu kardiyoloji pratiğinde uygulanan en zor ve en kompleks girişimsel işlemlerden biridir

- Çok sayıda intrakardiyak kateter ihtiyacı
- Transseptal kateterizasyon
- Yüksek seviyeli antikoagülasyon
- Yoğun ablasyon
- Uzun işlem ve fluoroskopi süresi
- Önemli komplikasyonlar
- Yüksek nüks oranı

REVIEW

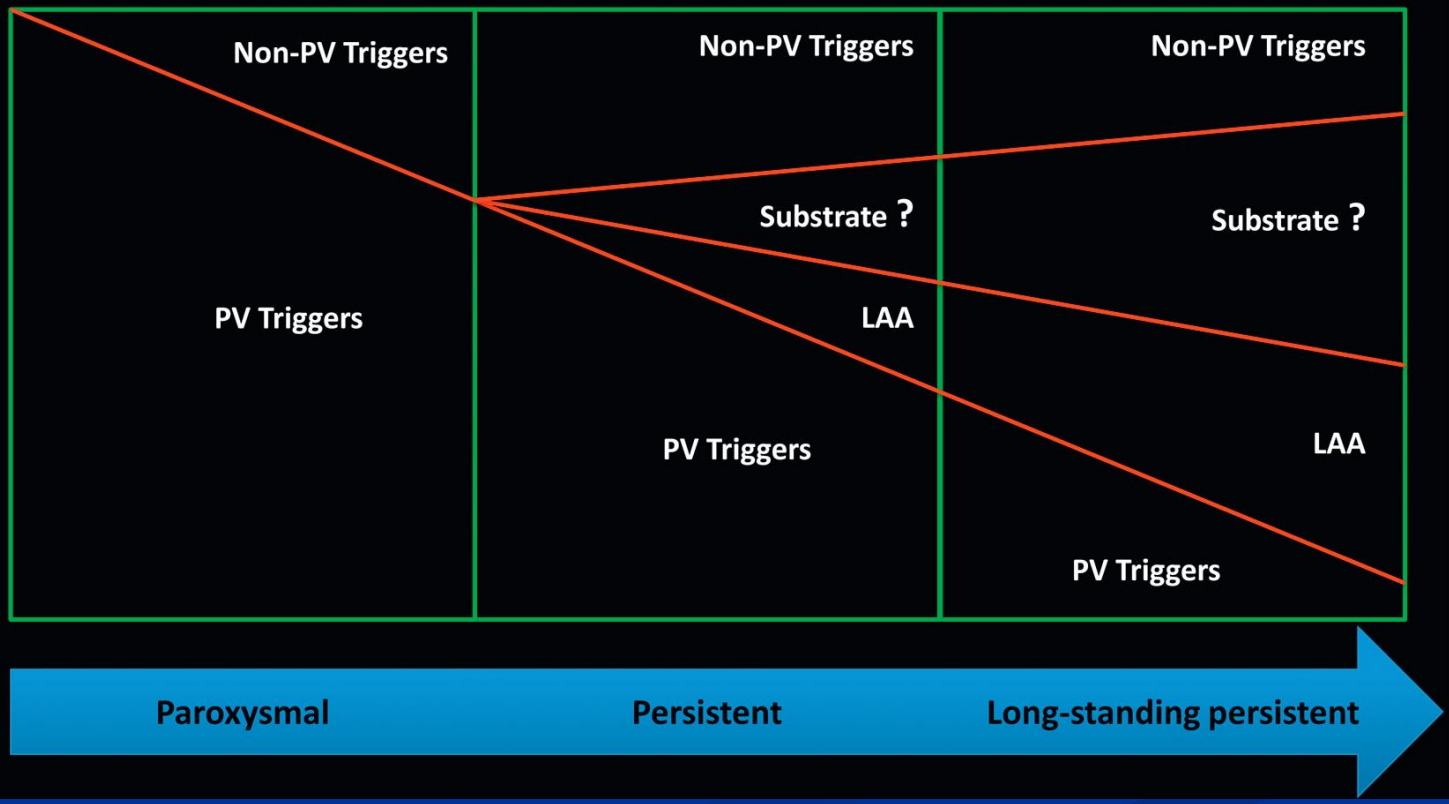
CURRENT OPINION

How to ablate long-standing persistent atrial fibrillation?

Luigi Di Biase[a,b,c,d], *Pasquale Santangeli*[a,c], *and Andrea Natale*[a,b,e,f,g]

- Persistan AF'da optimal ablasyon yöntemi bilinmemektedir.
- Tek başına PVI yetersizdir.
- Tek başına PVI ile LSP AF'de 2 yıllık başarı yaklaşık %25'dir.
- Sadece PVI yapıldığında tekrarlı uygulamalarda başarı oranı artmamaktadır.

Relative contribution of different ablation targets in the AF disease continuum



REVIEW

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- PV dışı tetikleyicilerin prevalansı ve önemi persistan AF'da paroksismallerden daha fazladır.
- Daha iyi ablasyon sonucu için PVI yanında PV dışı tetikleyicilerin tespiti ve ablasyonu şarttır.
- PVI yanında SVC, CS, LAA, septum ve LA posterior duvar izolasyonu başarıyı artırmaktadır. Redo vakalarda bu bölgelerin reizolasyonu uzun dönem başarıyı >%80 yapmaktadır

Persistan AF ablasyonu

- AHA/ACC/HRS AF kılavuzunda persistan AF'da ablasyonu IIa ve uzun süreli persistan AF ablasyonu IIb olarak önerilmektedir*
- Persistan AF'da 1 yıllık başarı oranı %50-60 arasındadır.
  - PVI izolasyonu tam ve uzun ömürlü değil
  - Non-PV odakların ablate edil(e)memesi

* January CT, Wann LS, Alpert JS, Field ME.
2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: executive summary. J Am Coll Cardiol. 2014.

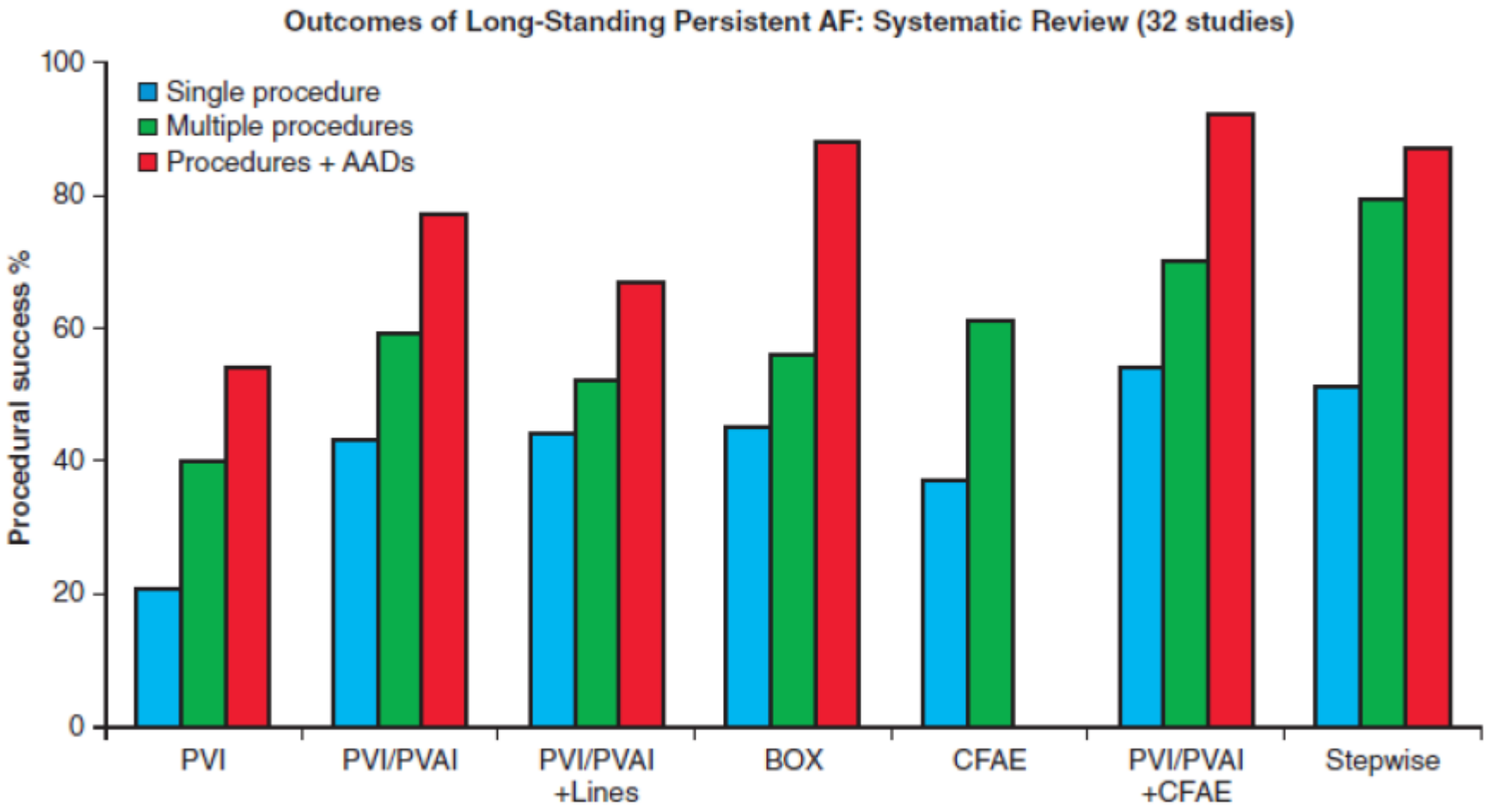


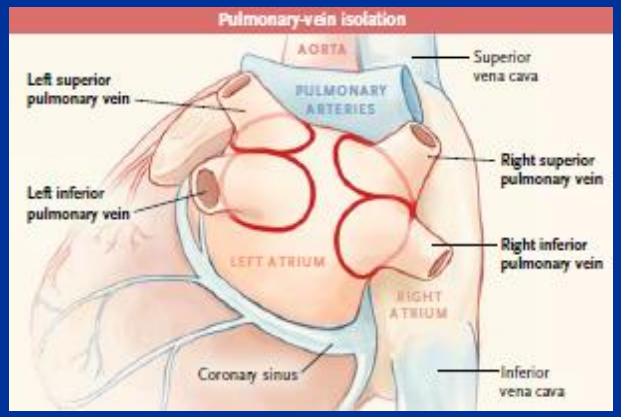
Figure 122-10. Summary of results from studies of catheter ablation for persistent atrial fibrillation.

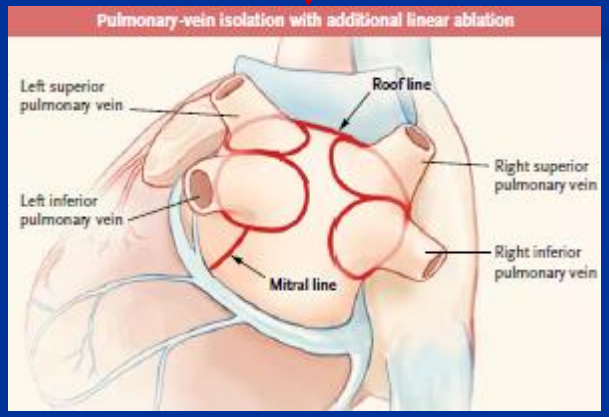
The NEW ENGLAND JOURNAL of MEDICINE

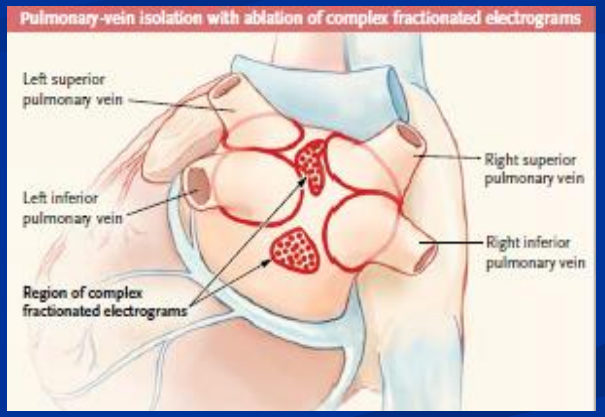
ORIGINAL ARTICLE

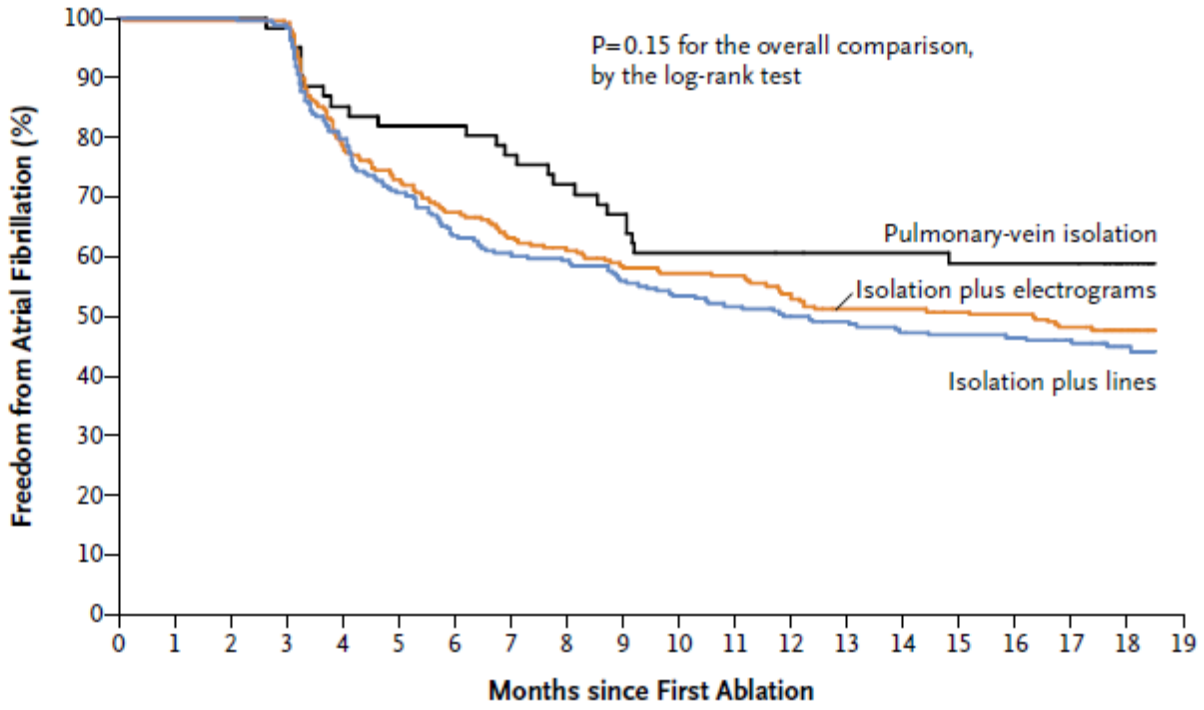
Approaches to Catheter Ablation for Persistent Atrial Fibrillation

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*









No. at Risk

Pulmonary-vein isolation	61	60	50	41	36	23
Isolation plus electrograms	244	242	161	137	124	72
Isolation plus lines	244	240	152	133	115	57

Figure 2. Freedom from Atrial Fibrillation.

The graph shows Kaplan–Meier estimates of freedom from documented atrial fibrillation more than 30 seconds after a single procedure, with or without the use of antiarrhythmic medications. There were no significant differences between groups (P=0.15). Isolation plus electrograms denotes ablation with pulmonary-vein isolation plus additional ablation of complex fractionated electrograms; isolation plus lines refers to ablation with pulmonary-vein isolation plus additional linear ablation.

Europace
doi:10.1093/europace/euv351

CLINICAL RESEARCH

The impact of adjunctive complex fractionated atrial electrogram ablation and linear lesions on outcomes in persistent atrial fibrillation: a meta-analysis

Paul A. Scott*, John Silberbauer, and Francis D. Murgatroyd

Department of Cardiology, King's College Hospital NHS Foundation Trust, Denmark Hill, London SE5 9RS, UK

Aims In persistent atrial fibrillation (PsAF), success rates for pulmonary vein isolation (PVI) alone are limited and additional substrate modification is often performed. The two most widely used substrate-based strategies are the ablation of complex fractionated atrial electrograms (CFAE) and left atrial linear ablation (LALA) at the roof and mitral isthmus. However, it is unclear whether adjunctive CFAE ablation or LALA add significant benefit to PVI alone. We performed a meta-analysis to better gauge the benefit of adjunctive CFAE ablation and LALA in PsAF.

Methods and results Electronic databases were systematically searched. We included studies that examined the impact of CFAE ablation or LALA in addition to a PVI-based strategy on clinical outcomes in PsAF. We included both randomized and non-randomized studies. Totally 10 studies ($n = 1821$) were included: 6 evaluating CFAE ablation, 3 LALA, and 1 both approaches. In comparison with PVI alone, the addition of CFAE ablation [RR 0.86; 95% confidence intervals (CI) 0.64, 1.16; $P = 0.32$] or LALA (RR 0.64; 95% CI 0.37, 1.09; $P = 0.10$) offered no significant improvement in arrhythmia-free survival. However, adjunctive CFAE ablation was associated with significant increases ($P < 0.05$) and LALA non-significant increases in procedure and fluoroscopy times.

Conclusion In PsAF, the addition of CFAE ablation or LALA, in comparison with PVI alone, offers no significant improvement in arrhythmia-free survival. Furthermore, they are associated with increases in both procedural and fluoroscopy times. The optimal ablation strategy for PsAF is currently unclear and needs further refinement.

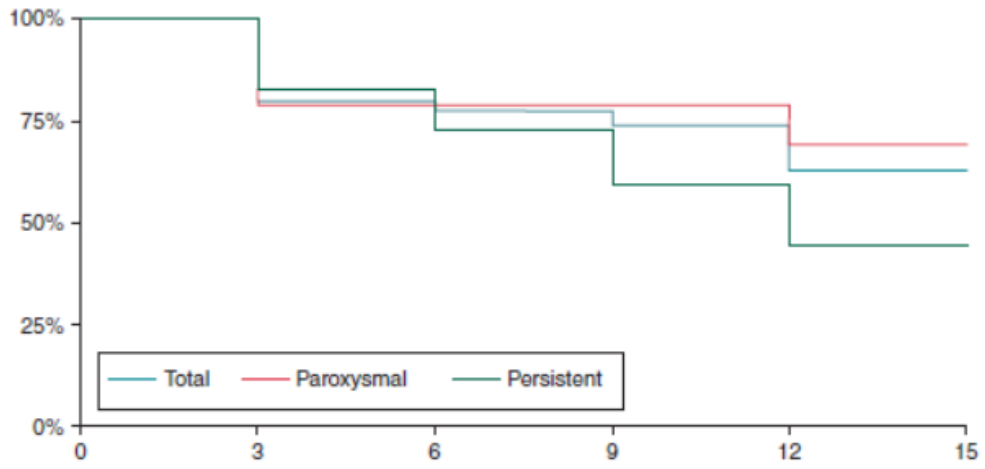
AF ABLASYONU

RF ablasyon

- Ensite
- CARTO

CRYO ablasyon

Efficacy and safety of pulmonary veins isolation by cryoablation for the treatment of paroxysmal and persistent atrial fibrillation



	3	6	9	12
Numbers at risk				
All patients	104	62	45	20
Paroxysmal AF	81	46	34	16
Persistent AF	23	16	11	4

Figure 3 Cumulative atrial fibrillation-free survivals of patients who underwent cryoablation for paroxysmal vs. persistent atrial fibrillation. $P = 0.167$.

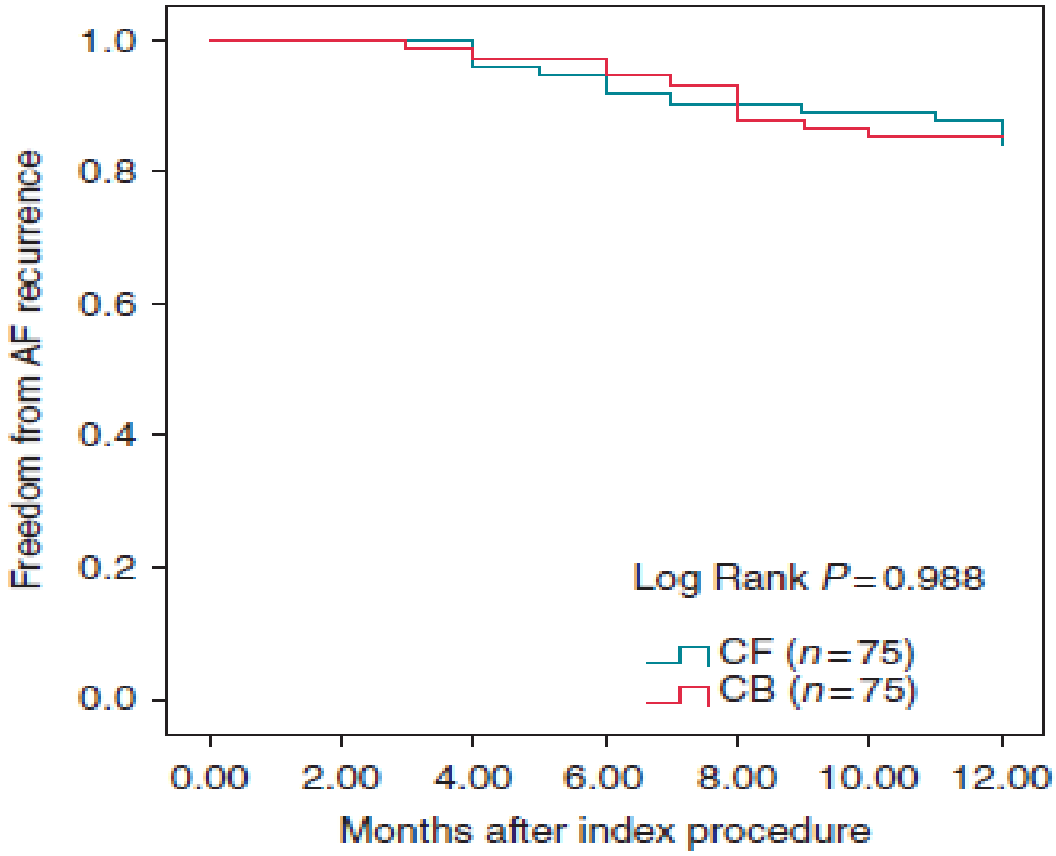
Europace (2015) 17, 225–231
doi:10.1093/europace/euu215

Contact-force guided radiofrequency vs. second-generation balloon cryotherapy for pulmonary vein isolation in patients with paroxysmal atrial fibrillation—a prospective evaluation

Aims In the setting of paroxysmal atrial fibrillation (AF), there are no available data comparing the mid-term outcome of patients undergoing pulmonary vein isolation (PVI) catheter ablation using contact-force (CF)-guided radiofrequency (RF) vs. second-generation balloon cryotherapy.

Methods and results Prospective single-centre evaluation, carried out from March 2011 to February 2013, comparing CF radiofrequency (Thermocool® SmartTouch™, Biosense Webster, Inc.) (CF group) with cryoballoon ablation (Arctic Front Advance™ 28 mm cryoballoon, Medtronic, Inc.) (CB group), in regards to procedural safety and efficacy, as well as recurrence at 12 months. Overall, 150 consecutive patients were enrolled (75 in each group). The characteristics of patients of both the groups were similar (61.2 ± 9.9 years, women 25.3%, mean AF duration 4.1 ± 4.0 years, mean CHA_2DS_2-VASc score 1.4 ± 1.3, mean HAS-BLED 1.4 ± 0.6). Duration of the procedure was significantly lower in the CF group (110.7 ± 32.5 vs. 134.5 ± 48.3 min, $P = 0.001$), with a lower duration of fluoroscopy (21.5 ± 8.5 vs. 25.3 ± 9.9 min, $P = 0.017$) and X-ray exposure (4748 ± 2411 cGy cm^2 vs. 7734 ± 5361 cGy cm^2, $P = 0.001$). In contrast, no significant difference was found regarding significant procedural complication (2.7 vs. 1.3% in CF and CB groups, respectively; $P = 0.56$), and PVI was eventually achieved in all cases. At 12 months, AF recurrence occurred in 11 patients (14.7%) in the CB group and in 9 patients (12.0%) in the CF group (HR = 1.20 95% CI 0.50–2.90; log rank $P = 0.682$).

Conclusions Our preliminary findings suggest that CF-guided radiofrequency and cryotherapy present very similar performances in the setting of paroxysmal AF catheter ablation.

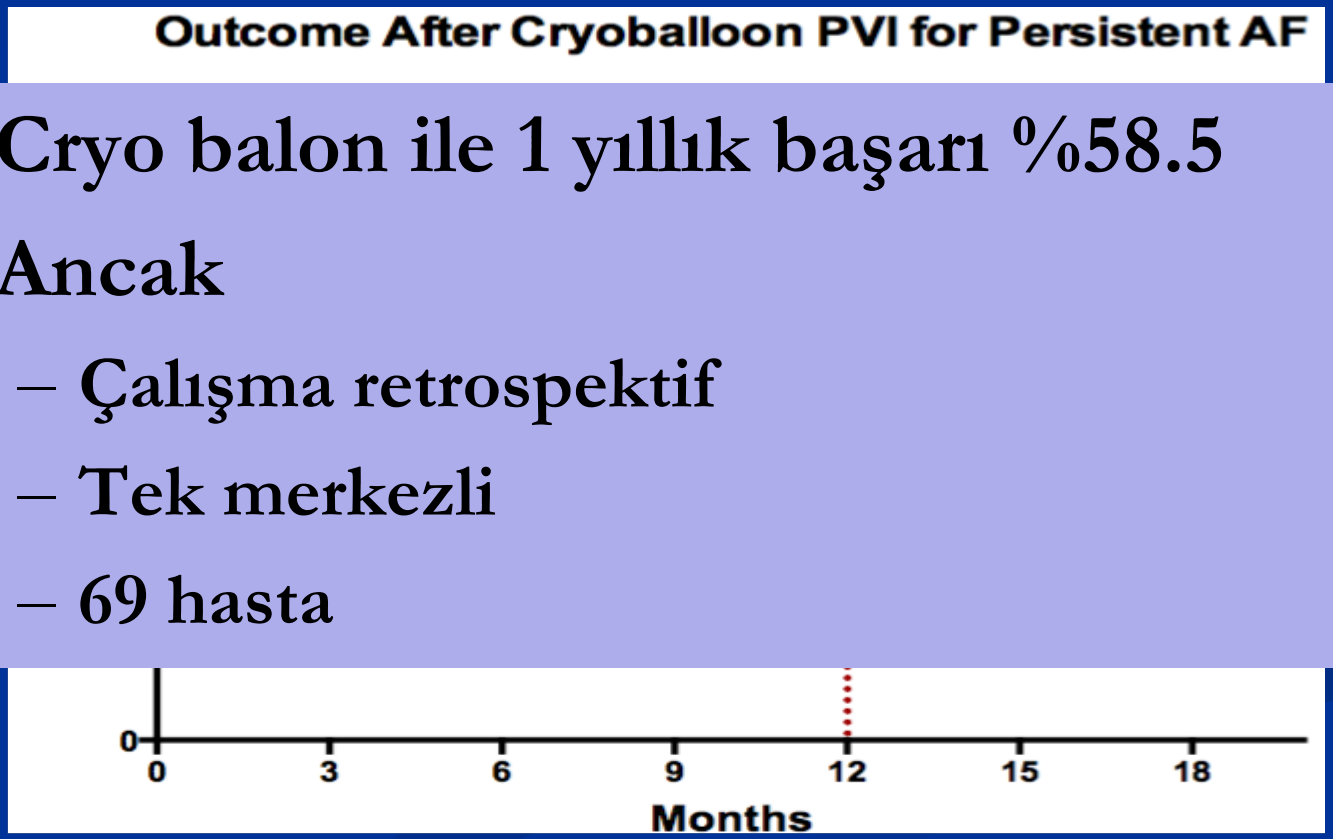


	3 months	6 months	9 months	12 months
CF	75	69	67	66
CB	74	71	63	62

Figure 3 Kaplan–Meier survival curve—proportion of patients free of AF during the 12-month follow-up (3-month blanking period).

Efficacy of Cryoballoon Pulmonary Vein Isolation in Patients with Persistent Atrial Fibrillation

Guhl EN, Siddoway D, Adelstein E, Voigt A, Saba S, Jain SK.



- Cryo balon ile 1 yıllık başarı %58.5
- Ancak
  - Çalışma retrospektif
  - Tek merkezli
  - 69 hasta

Europace (2015) **17**, 559–565
doi:10.1093/europace/euu350

Circumferential pulmonary vein isolation as index procedure for persistent atrial fibrillation: a comparison between radiofrequency catheter ablation and second-generation cryoballoon ablation

Giuseppe Ciconte*†, Giannis Baltogiannis†, Carlo de Asmundis, Juan Sieira, Giulio Conte, Giacomo Di Giovanni, Yukio Saitoh, Ghazala Irfan, Giacomo Mugnai, Burak Hunuk, Gian-Battista Chierchia‡, and Pedro Brugada‡

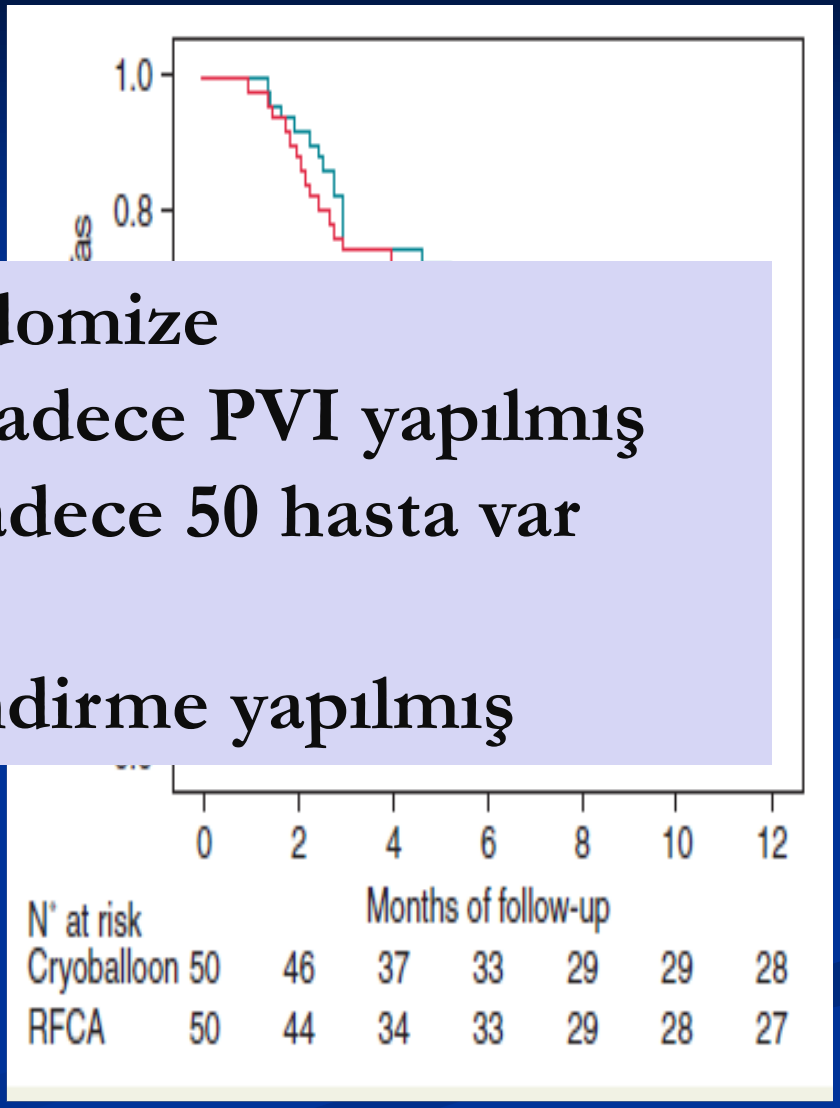
Aims To assess the 1 year efficacy of pulmonary vein isolation (PVI) as index procedure for persistent atrial fibrillation (PersAF) comparing conventional radiofrequency irrigated-tip catheter ablation (RFCA) using contact-force technology and ablation using the second-generation cryoballoon (CB-AdvA).

Methods and results One hundred consecutive patients (74 male, 74%; mean age 62.4 ± 9.6 years) with drug-refractory PersAF undergoing PVI using RFCA and CB-AdvA were enrolled. Follow-up was based on outpatient clinic visits including Holter-electrocardiograms. Recurrence of atrial tachyarrhythmias (ATas) was defined as a symptomatic or documented episode >30 s. Among 100 patients, 50 underwent RFCA whereas 50 CB-AdvA. Mean procedure and fluoroscopy times were 90.5 ± 41.7 vs. 140.2 ± 46.9 min and 14.5 ± 6.6 vs. 19.8 ± 6.8 min in the CB-Adv and in the RFCA group, respectively ($P < 0.01$). At 1 year follow-up, after a 3 months blanking period (BP), freedom from ATas off-drugs after a single procedure was 60% (28/50 patients) in the CB-Adv and 56% (27/50 patients) in the RFCA group ($P = 0.71$). Multivariate analysis demonstrated that PersAF duration ($P = 0.01$) and relapses during BP ($P = 0.02$) were independent predictors of ATa recurrences following the index procedure.

Conclusion Freedom from ATas following PersAF ablation with RFCA and CB-Adv is comparable at 1 year follow-up after a single procedure. Ablation with the CB-Adv is associated with shorter procedure time and radiation exposure as compared with RFCA. Atrial tachyarrhythmias occurrence during BP and longer time of PersAF seem to be significant predictors of arrhythmia recurrences after the index procedure.

Table I Clinical and procedural characteristics of the study population

	CB-Adv ($n = 50$)	RFCA ($n = 50$)	Pvalue
Total AF duration, months	32.7 ± 37.6	26.7 ± 23.7	0.35
Persistent AF duration, months	7.2 ± 2.2	7.6 ± 1.8	0.33
Procedure duration, minutes	90.5 ± 41.7	140.2 ± 46.9	<0.01
Fluoroscopy duration, minutes	14.5 ± 6.6	19.8 ± 6.8	<0.01



- Non-prospektif, non-randomize
- Cryo ve RF gruplarında sadece PVI yapılmış
- Çalışmada gruplarında sadece 50 hasta var
- Takip 1 yıllık
- Sadece holter ile değerlendirme yapılmış

Çözüm?

- Substrat modifikasyonu için daha hasta spesifik ablasyon yaklaşımları
  - Fokal tetikleyicilerin ve rotorların daha iyi belirlenmesi
  - Düşük voltajlı atriyal alanların ablasyonu

REVIEW

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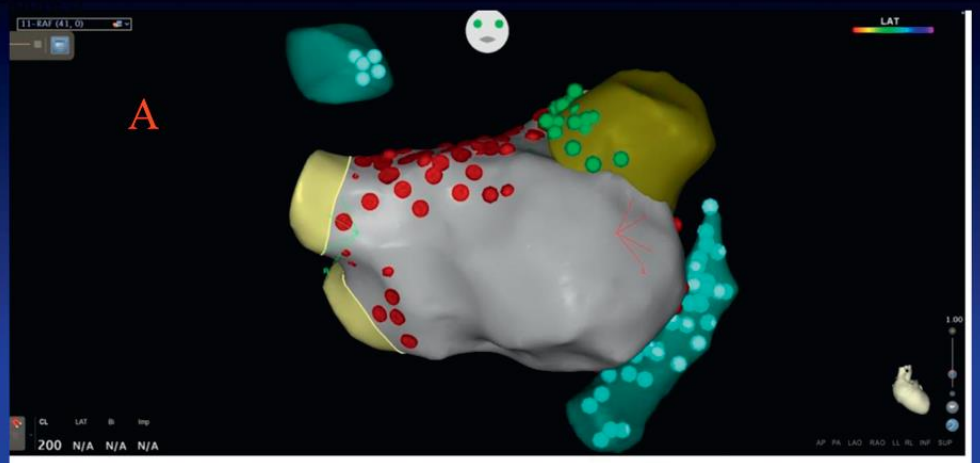
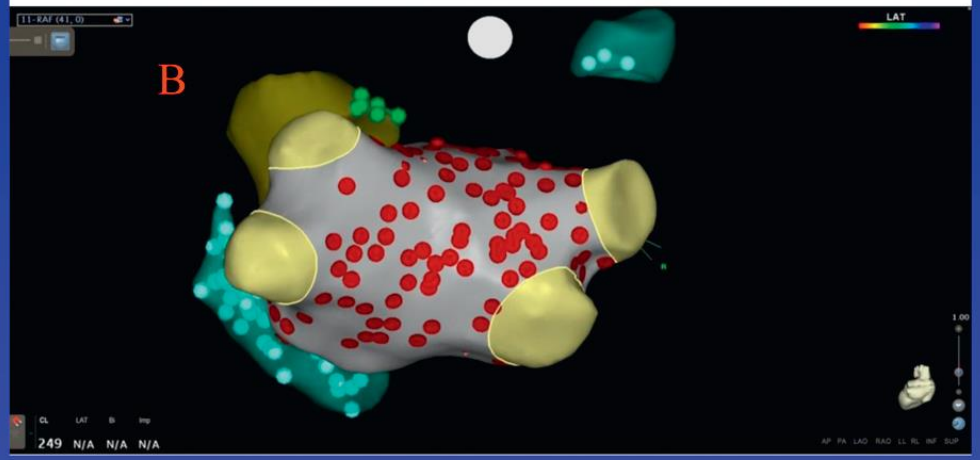
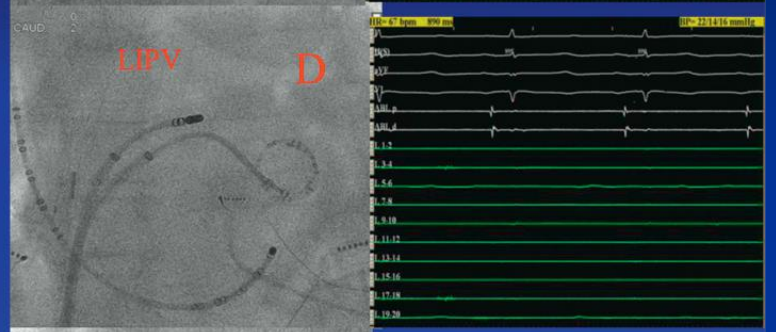
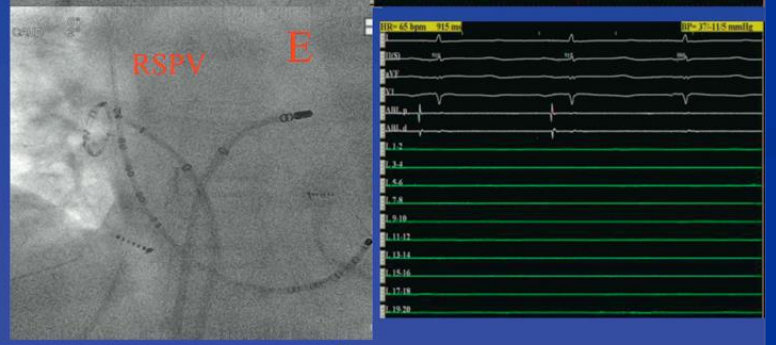
- Lasso kateter yardımıyla sol PV'lerin antrumunda yaygın ablasyon yaparak PVI
- LA posterior duvar ve septumun sol tarafında ablasyon
- Lasso kateter yardımıyla sağ PV'lerin antrumunda yaygın ablasyon yaparak PVI
- Sol atriyumda ve CS içinde CFAE ablasyonu
- LAA izolasyonu
- RF esnasında sinüs ritmi sağlanmadıysa CV
- 15-20 dk boyunca 30 mg/dk isoproterenol infüzyonu ile non-PV tetikleyicilerin ve PV rekonneksiyonun tespiti ve ablasyonu
- SVC izolasyonu
- CARTO: Termocool, 41 C ve 40 -45W (posterior duvar 35 W), flow rate: 30 ml/dk

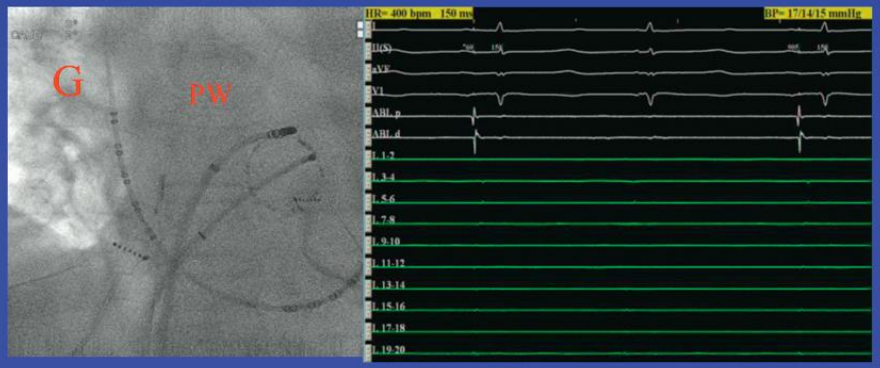

A
LAT
200 N/A N/A N/A

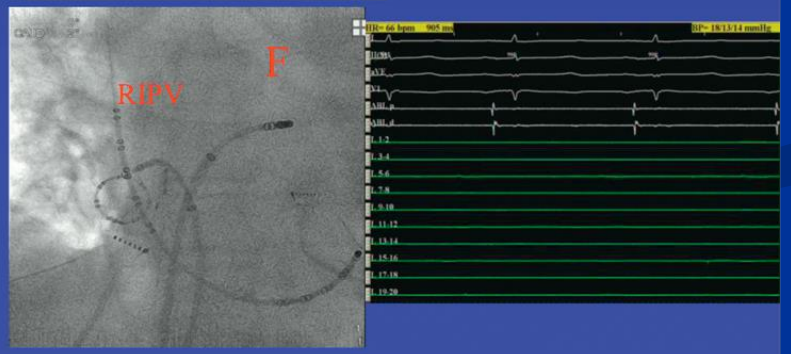

B
LAT
249 N/A N/A N/A


LSPV
C

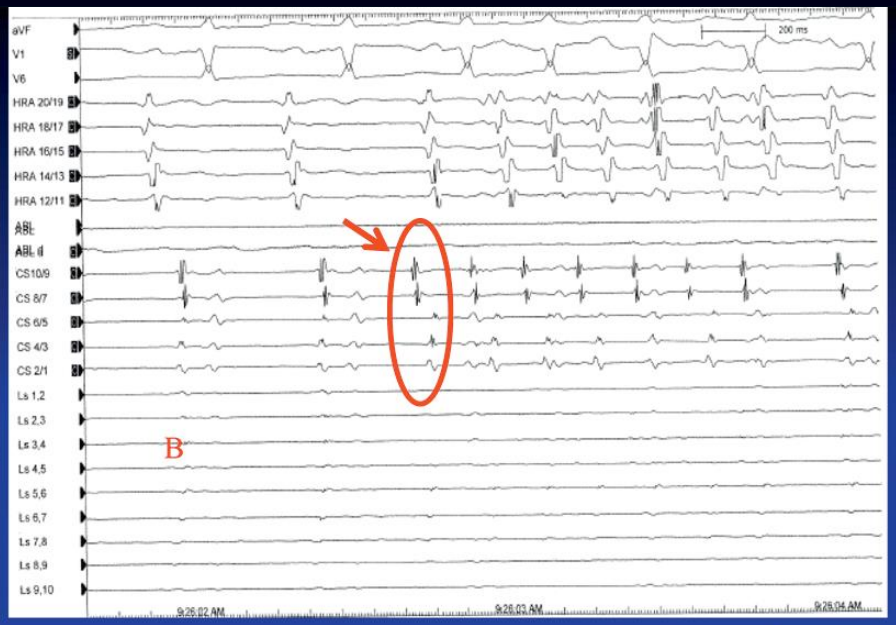

LIPV
D

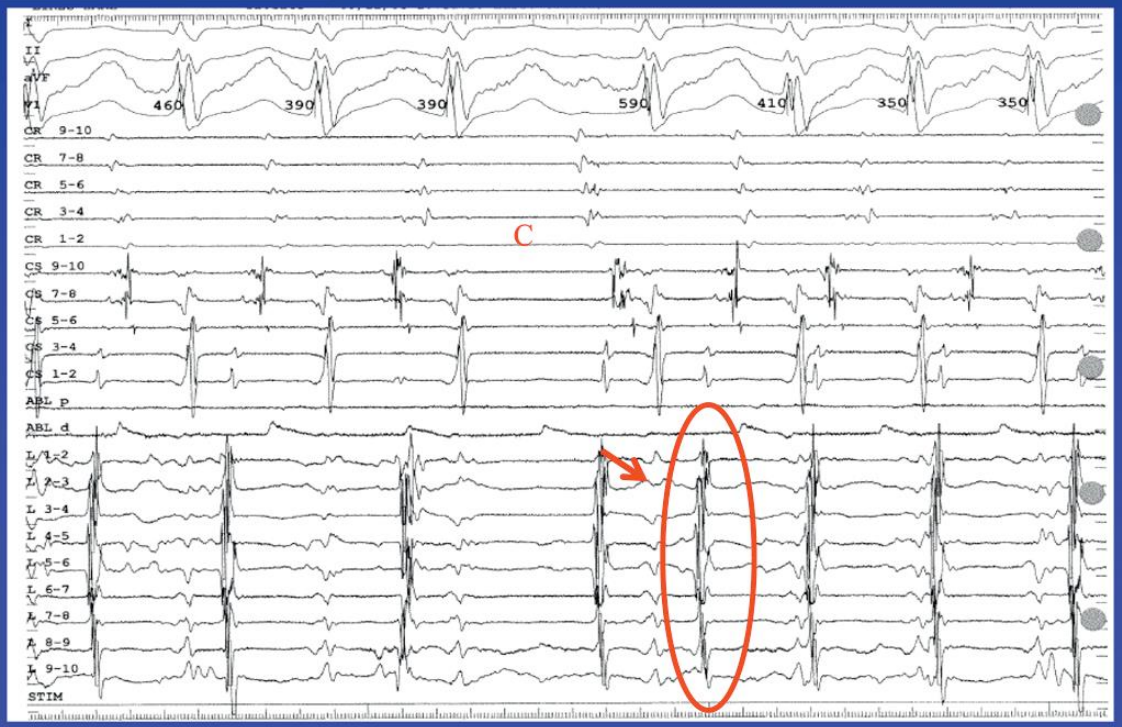

RSPV
E


G
PW


RIPV
F


A


aVF
V1
V6
HRA 20/19
HRA 18/17
HRA 16/15
HRA 14/13
HRA 12/11
ABL
ABL d
CS10/9
CS 8/7
CS 6/5
CS 4/3
CS 2/1
Ls 1,2
Ls 2,3
Ls 3,4
Ls 4,5
Ls 5,6
Ls 6,7
Ls 7,8
Ls 8,9
Ls 9,10
200 ms
B


I
II
aVF
V1
460
390
390
590
410
350
350
CR 9-10
CR 7-8
CR 5-6
CR 3-4
CR 1-2
C
CS 9-10
CS 7-8
CS 5-6
CS 3-4
CS 1-2
ABL P
ABL d
L 1-2
L 2-3
L 3-4
L 4-5
L 5-6
L 6-7
L 7-8
L 8-9
L 9-10
STIM

REVIEW

CURRENT OPINION

How to ablate long-standing persistent atrial fibrillation?

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REASONS FOR A HIGHER SUCCESS RATE ON LONG-STANDING PERSISTENT AF ABLATION

- Increasing RF power 30 to 40 to 45 W
- More proximal LA isolation
- Systematic isolation of the SVC
- More emphasis on non-PV triggers

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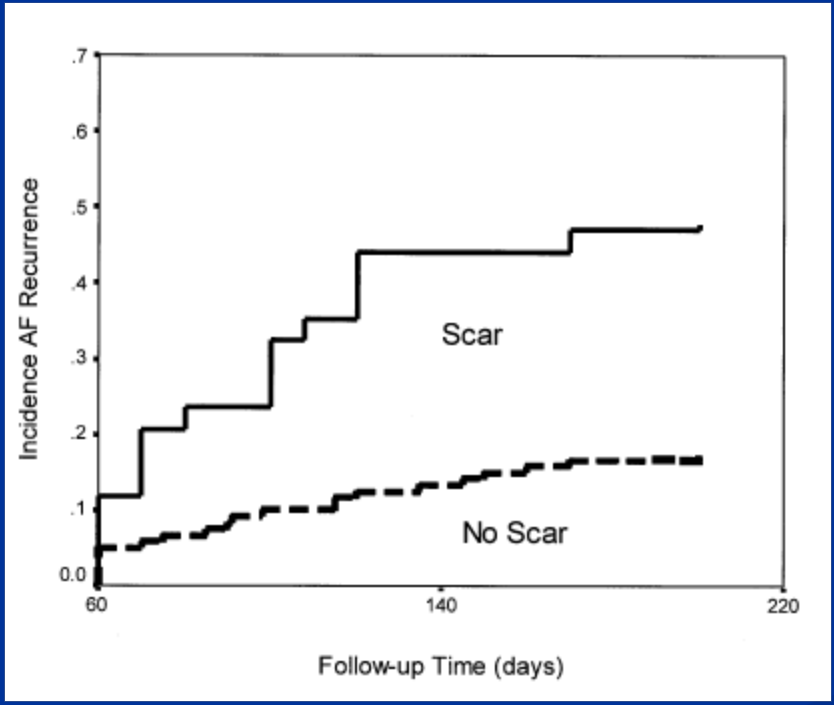
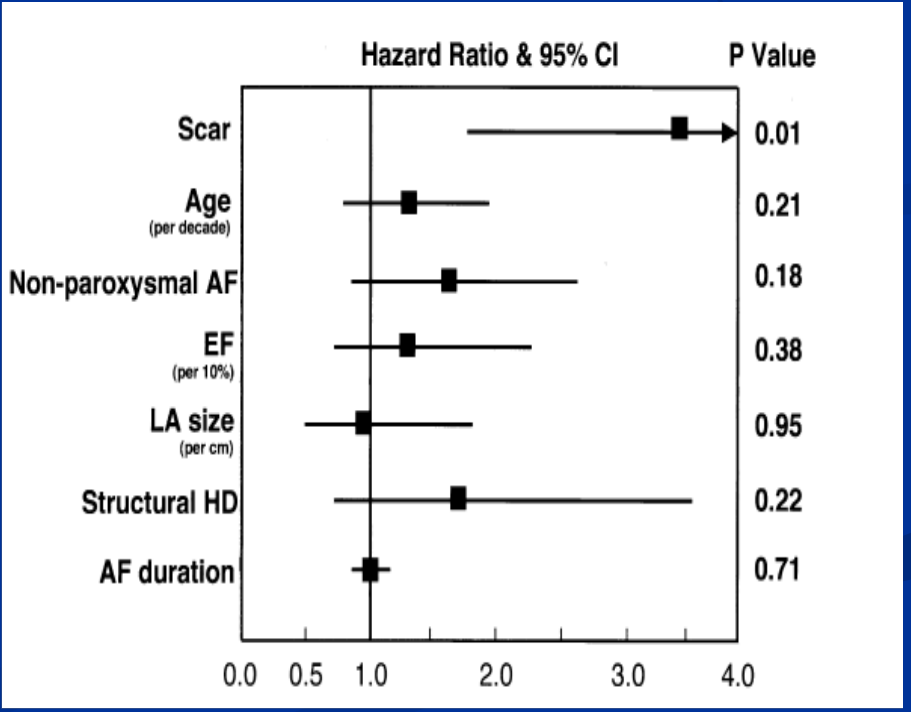
Pre-Existent Left Atrial Scarring in Patients Undergoing Pulmonary Vein Antrum Isolation

An Independent Predictor of Procedural Failure

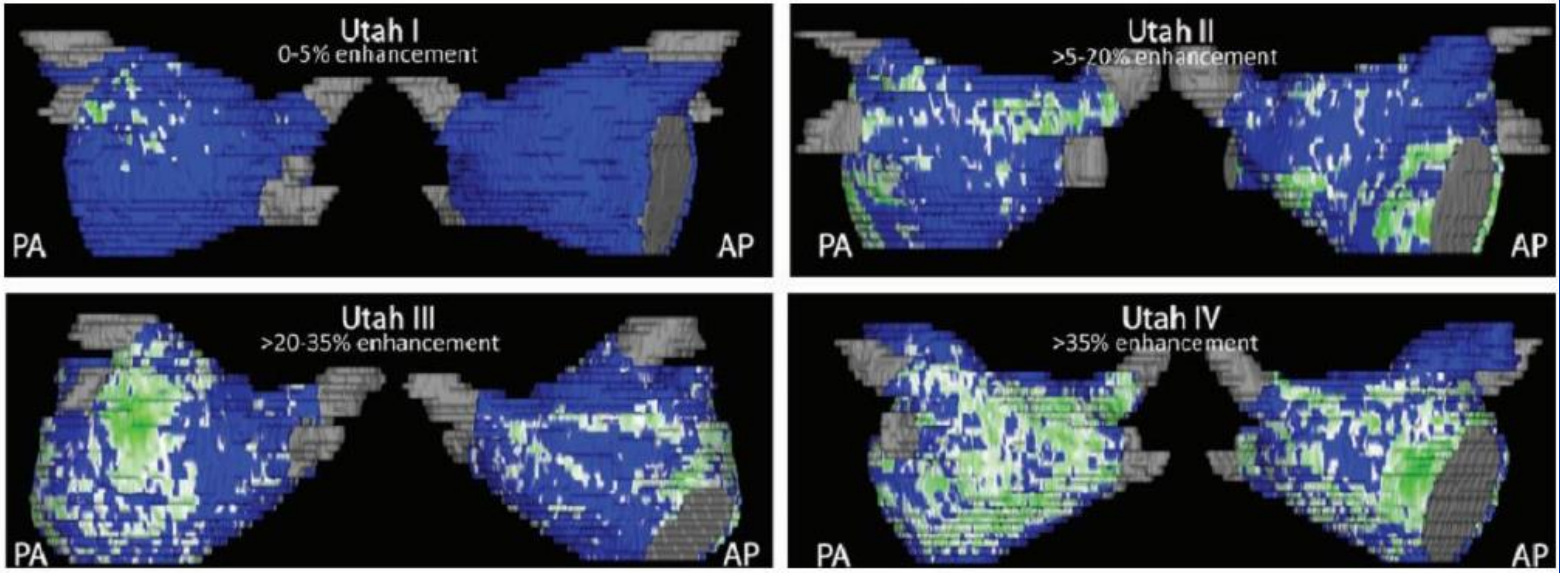
Atul Verma, MD, Oussama M. Wazni, MD, Nassir F. Marrouche, MD, David O. Martin, MD, Fethi Kilicaslan, MD, Stephen Minor, MD, Robert A. Schweikert, MD, Walid Saliba, MD, Jennifer Cummings, MD, J. David Burkhardt, MD, Mandeep Bhargava, MD, William A. Belden, MD, Ahmad Abdul-Karim, MD, Andrea Natale, MD

Cleveland, Ohio



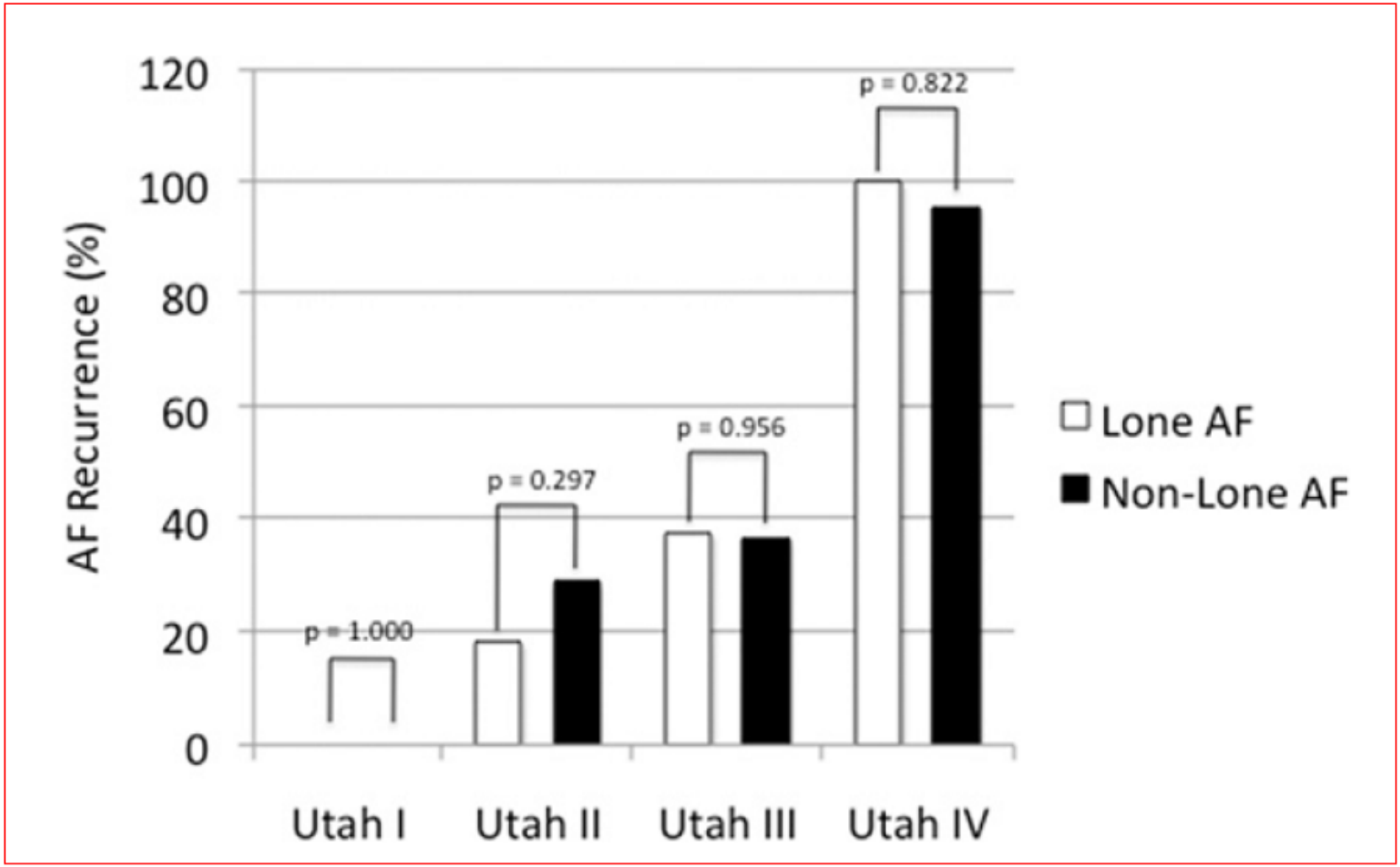


Evaluation of the left atrial substrate in patients with lone atrial fibrillation using delayed-enhanced MRI: Implications for disease progression and response to catheter ablation



SONUÇ: DE-MRI ile saptanan sol atriyal yapısal yeniden şekillenmenin derecesi AF tipinden ve ilişkili komorbiditelerden bağımsızdır. Kateter ablasyonu için uygun hastaların seçiminde atriyal fibrozisin niteliği ve niceliği işlem başarısını arttırırken gereksiz işlem yapılmasını önleyecektir.

Heart Rhythm. 2010; 7(10): 1475–1481



Heart Rhythm. 2010; 7(10): 1475–1481

Box Isolation of Fibrotic Areas (BIFA): A Patient-Tailored Substrate Modification Approach for Ablation of Atrial Fibrillation

HANS KOTTKAMP, M.D., JAN BERG, M.D., RODERICH BENDER, M.D., ANDREAS RIEGER, M.D., and DOREEN SCHREIBER, M.D.

From the Hirslanden Hospital, Department of Electrophysiology, Zurich, Switzerland

Substrate Modification BIFA in AF Ablation. *Background:* Catheter ablation strategies beyond pulmonary vein isolation (PVI) for treatment of atrial fibrillation (AF) are less well defined. Increasing clinical data indicate that atrial fibrosis is a critical common left atrial (LA) substrate in AF patients (pts).

Objective: We applied a new substrate modification concept according to the individual fibrotic substrate as estimated from electroanatomic voltage mapping (EAVM) in 41 pts undergoing catheter ablation of AF.

Results: First, EAVM during sinus rhythm was done in redo cases of 10 pts with paroxysmal AF despite durable PVI. Confluent low-voltage areas (LVA) were found in all pts and were targeted with circumferential isolation, so-called box isolation of fibrotic areas (BIFA). This strategy led to stable sinus rhythm in 9/10 pts and was transferred prospectively to first procedures of 31 pts with nonparoxysmal AF. In 13 pts (42%), no LVA (<0.5 mV) were identified, and only PVI was performed. In 18 pts (58%), additional BIFA strategies were applied (posterior box in 5, anterior box in 7, posterior plus anterior box in 5, no box in 1 due to diffuse fibrosis). Mean follow-up was 12.5 ± 2.4 months. Single-procedure freedom from AF/atrial tachycardia was achieved in 72.2% of pts and in 83.3% of pts with 1.17 procedures/patient.

Conclusions: In approximately 40% of pts with nonparoxysmal AF, no substantial LVA were identified, and PVI alone showed high success rate. In pts with paroxysmal AF despite durable PVI and in approximately 60% of pts with nonparoxysmal AF, individually localized LVA were identified and could be targeted successfully with the BIFA strategy. *(J Cardiovasc Electrophysiol, Vol. 27, pp. 22-30, January 2016)*

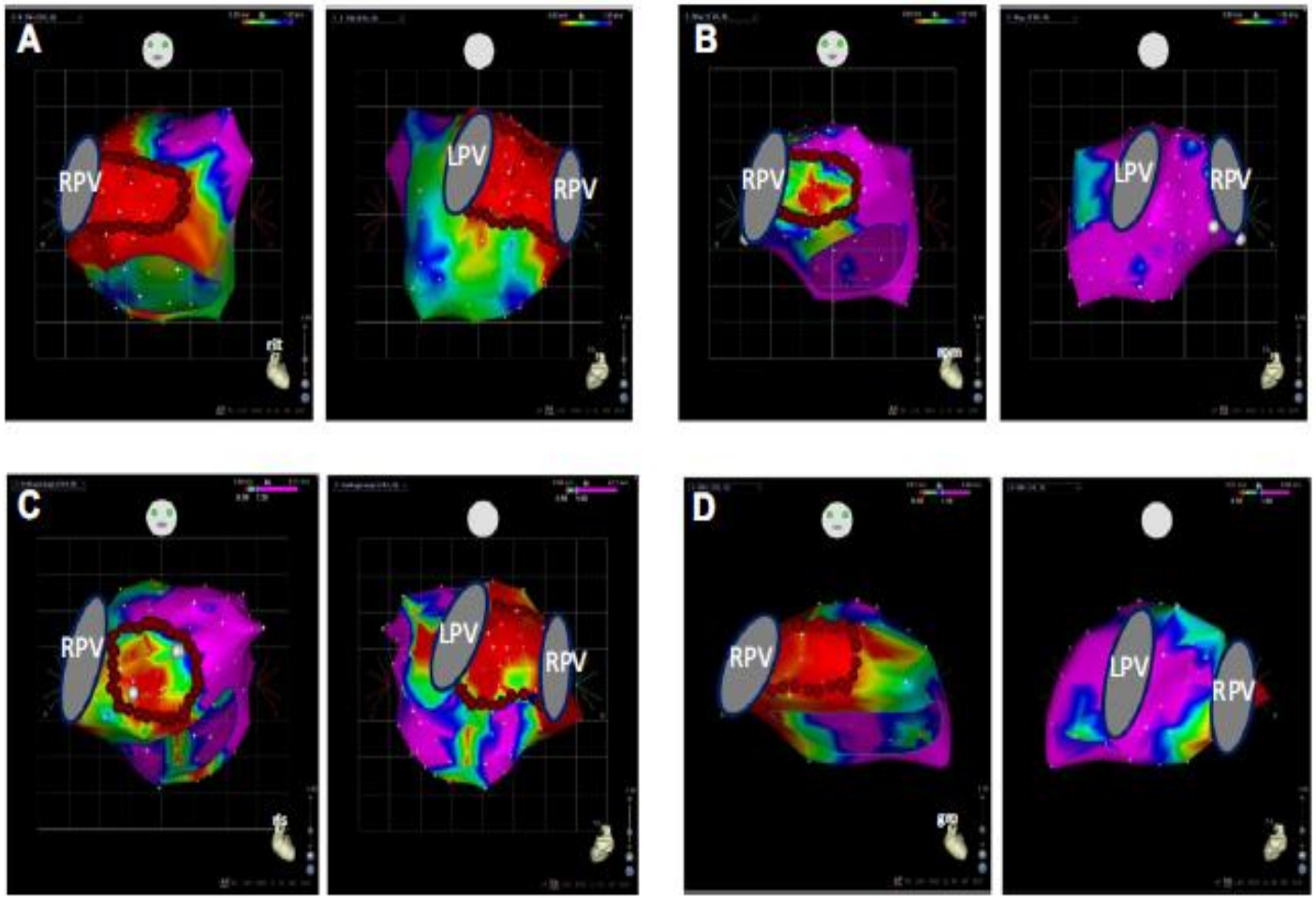


Figure 1. *Left atrial voltage mapping in four patients with recurrences of paroxysmal atrial fibrillation despite durable pulmonary vein isolation (PVI) showing the variable severity and localization of left atrial fibrosis. Box isolation of the fibrotic areas (BIFA) is done in all cases with connection to the previous PVI lines. Color coding: red for substantially reduced voltages <0.5 mV and purple >1.5 mV. LPV and RPV = left and right pulmonary veins.*

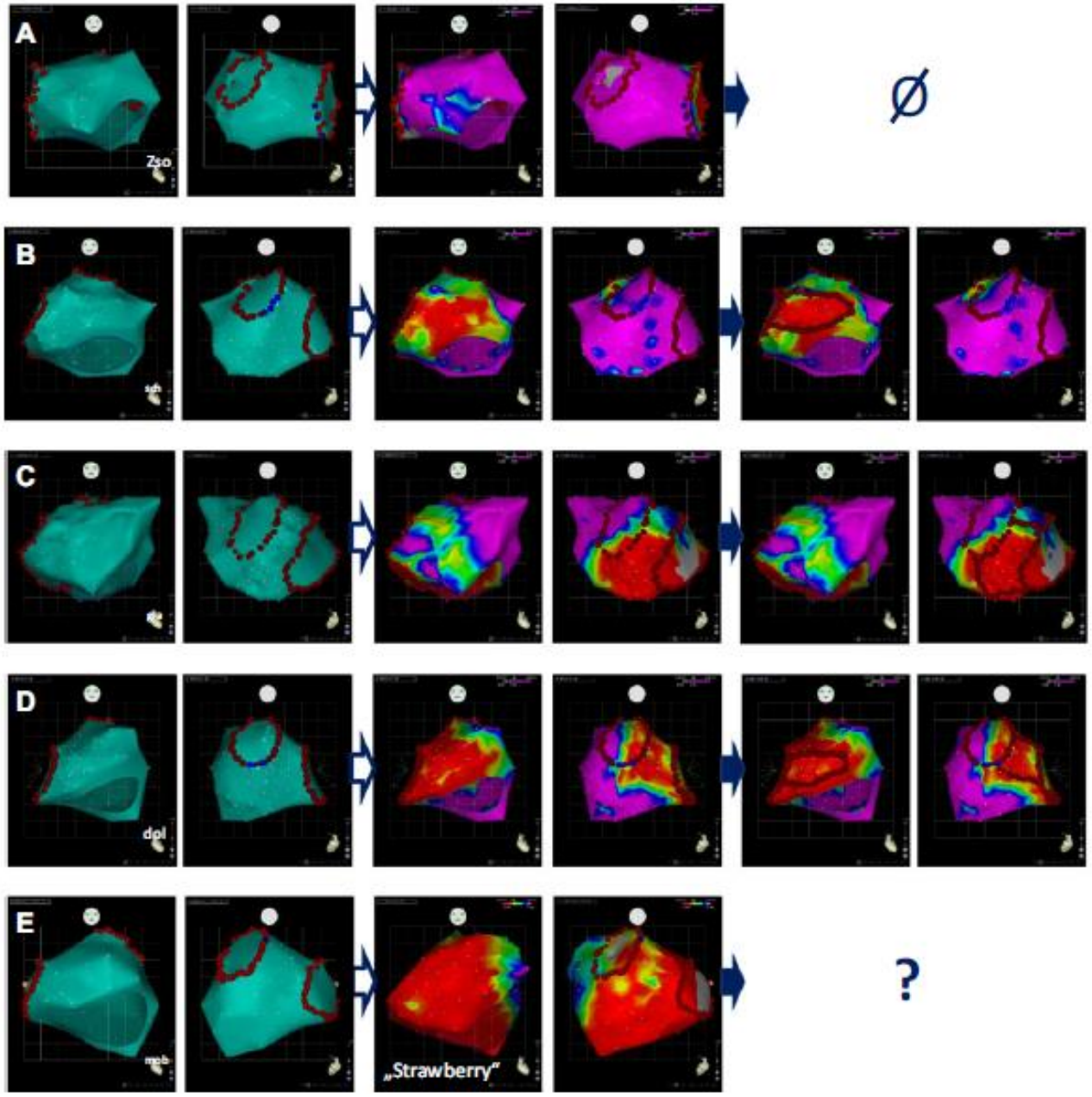


Figure 4. *Individually tailored substrate modification strategy in patients with non-paroxysmal atrial fibrillation (AF). After circumferential pulmonary vein isolation (PVI) during ongoing AF, the patients are electrically cardioverted and electroanatomic voltage mapping is performed during sinus rhythm. A: In patients without substantial low-voltage areas, the procedure is done with PVI. B–D: In patients with areas of low voltage, box isolation of fibrotic areas (BIFA) is performed according to the individual localization of the substrate. E: In patients with massive and diffuse fibrosis, no clear BIFA concept is available and additional ablation procedures are discouraged after failure of PVI. Abbreviations as in Figures 1 and 2.*

Sonuçlar

- Paroksismal AF
  - PV izolasyonun devam etmesine rağmen AF rekürrensi olan paroksismal AF'li hastaların tamamnında düşük voltaj alanları bulundu
  - BIFA yapılan 9/10 hasta 20±13 ayda sinüs ritmindeydi.
- Non-paroksismal AF
  - Hastaların %40'ında düşük voltaj alanı yoktu ve bunlarda sadece PVI ile %70 başarı
  - Hastaların %60'ında düşük voltaj alanı vardı ve PVI+BIFA ile %72 başarı

Persistan AF'da sadece PVI?

- SARA çalışması*

Sadece PVI'ın yeterli olabileceği hasta gruplarında Cryoablasyon tercih edilebilir.

* Mont L, Bisbal F, Hernandez-Madrid A, Perez-Castellano N, Vinolas X, Arenal A et al. Catheter ablativo vs antiarrhtyhmic drug treatment of persistant atriyal fibrillation: a multicentre, randomized, controller trial (SARA study).
Eur Heart J 2014;35:501-7.

CRYO balon ne yapamaz

- Lineer ablasyon yapamaz
- CFAE ablasyonu yapamaz
- Non-PV tetikleyicilerin ablasyonunu yapamaz
- Fokal impulse ve rotor modulasyonu (FIRM) yapamaz
- Otomomik modulasyon (Ganglionik pleksus ablasyonu)?
- LAA ablasyonu?
- Sağ atriyum ablasyonu yapamaz (İntercaval ablasyon, CTI ablasyonu, SVC?)
- Atriyumda voltaj mapping yapamaz
- Atriyal taşikardi için aktivasyon mapping yapamaz

Combined use of cryoballoon and focal open-irrigation radiofrequency ablation for treatment of persistent atrial fibrillation: Results from a pilot study

Moussa Mansour, MD,*† Giovanni B. Forleo, MD, PhD,† Augusto Pappalardo, MD,† Conor Barrett, MD,* E. Kevin Heist, MD,* Andrea Avella, MD,† Gianluigi Bencardino, MD,† Antonio Dello Russo, MD, PhD,† Michela Casella, MD, PhD,† Jeremy N. Ruskin, MD,* Claudio Tondo, MD, PhD*†

*From *Massachusetts General Hospital, Heart Center, Boston, Massachusetts, and †Cardiac Arrhythmia and Heart Failure Research Institute, St. Camillo-Forlanini Hospital, Catholic University of Sacred Heart, Rome, Italy.*

BACKGROUND Pulmonary vein isolation (PVI) achieved using a cryoballoon has been shown to be safe and effective. This treatment modality has limited effectiveness for treatment of persistent atrial fibrillation (AF).

OBJECTIVE The purpose of this study was to evaluate a combined approach using a cryoballoon for treatment of PVI and focal radiofrequency (RF) left atrial substrate ablation for treatment of persistent AF.

METHODS Twenty-two consecutive patients with persistent AF were included in the study. PVI initially was performed with a cryoballoon. Left atrial complex fractionated atrial electrograms (CFAEs) then were ablated using an RF catheter. Finally, linear ablations using the RF catheter were performed.

RESULTS Eighty-three PVs, including five with left common ostia, were targeted and isolated (100%). Seventy-seven (94%) of 82 PVs targeted with the cryoballoon were isolated, and 5 (6%) required use of RF energy to complete isolation. A mean of 9.7 ± 2.6 cryoablation applications per patient was needed to achieve PVI. Median time required for cryoablation per vein was 600 seconds, and mean number of balloon applications per vein was 2.5 ± 1.0. In 19 (86%) patients in whom AF persisted after PVI, CFAE areas were ablated using the RF catheter. Two cases of transient phrenic nerve paralysis occurred. After a single procedure and mean follow-up of 6.0 ± 2.9 months, 86.4% of patients were AF-free without antiarrhythmic drugs.

CONCLUSION A combined approach of cryoablation and RF ablation for treatment of persistent AF is feasible and is associated with a favorable short-term outcome.

KEYWORDS Atrial fibrillation; Balloon catheter; Catheter ablation; Cryoablation; Pulmonary vein isolation

ABBREVIATIONS **AF** = atrial fibrillation; **CFAE** = complex fractionated atrial electrogram; **CS** = coronary sinus; **LA** = left atrium; **PV** = pulmonary vein; **PVI** = pulmonary vein isolation; **RF** = radiofrequency

(Heart Rhythm 2010;7:452–458)

Sonuç

- İster RF isterse CRYO ile yapılsın persistan AF'li hastalarda tek başına PVI yeterli değildir.
- RF ile PVI'ya ek yapılan substrat ablasyonu çalışmalarında elde edilen yetersiz sonuçlar henüz optimal RF ablasyon yönteminin bilinmemesine bağlıdır.

Sonuç

- PV izolasyonuna ek olarak RF ile substrat ve PV dışı tetikleyiciler uygun ve etkin şekilde ablate edilirse (özellikler redo olgularda) başarı >%80 olmaktadır. Bu Cryoablasyon ile mümkün değildir.
- Persistan AF ablasyonunda sadece PVI yapabilme imkanı veren Cryoablasyon yapmak yerine RF ile PVI+daha iyi substrat ablasyonu hedeflenmelidir
    - LA'da skar alanı olmayan hastalarda CRYO ile PVI?