Atriyal Fibrilasyon Ablasyonunda Yeni Yöntemler (Rotor, CFAE, Lazer, vb)

Dr. Serkan Saygı
İzmir Üniversitesi Hastanesi

- **CFAE**
- **Rotor ablasyonu**

- **Lazer balon ablasyon, single shot device**

Atriyal Fibrilasyon

Fokal tetikleyici
PV/PV dışı

Substrat
Fibrozis
Yavaş ileti
Anizotropi
GP otonomik aktivite

Sürdürücü (driver)

CFAE
ROTOR
dominant frequency

COMPLEX FRACTIONATED ATRIAL ELECTROGRAM (CFAE)

CFAE➔kritik substratı gösterebilir

- Sol atriyal eklenti alanları: PV, LAA, CS

  Haissaguerre et al, JCE 2005

- Mikro-fibrozis alanları

  Jaquemet et al, Heart Rhythm 2009

- Pivot nokta, yavaş iletim, anizotropi alanları

  Konings et al, Circulation 1994; Spach et al, Circ Res 1986

- **Rotor/driver** barındıran alanların kenar bölgeleri

  Kalifa et al, Circulation 2006; Jalie et al, Cardiovasc Res 2002

- Artmış GP otonomik aktivite bölgeleri

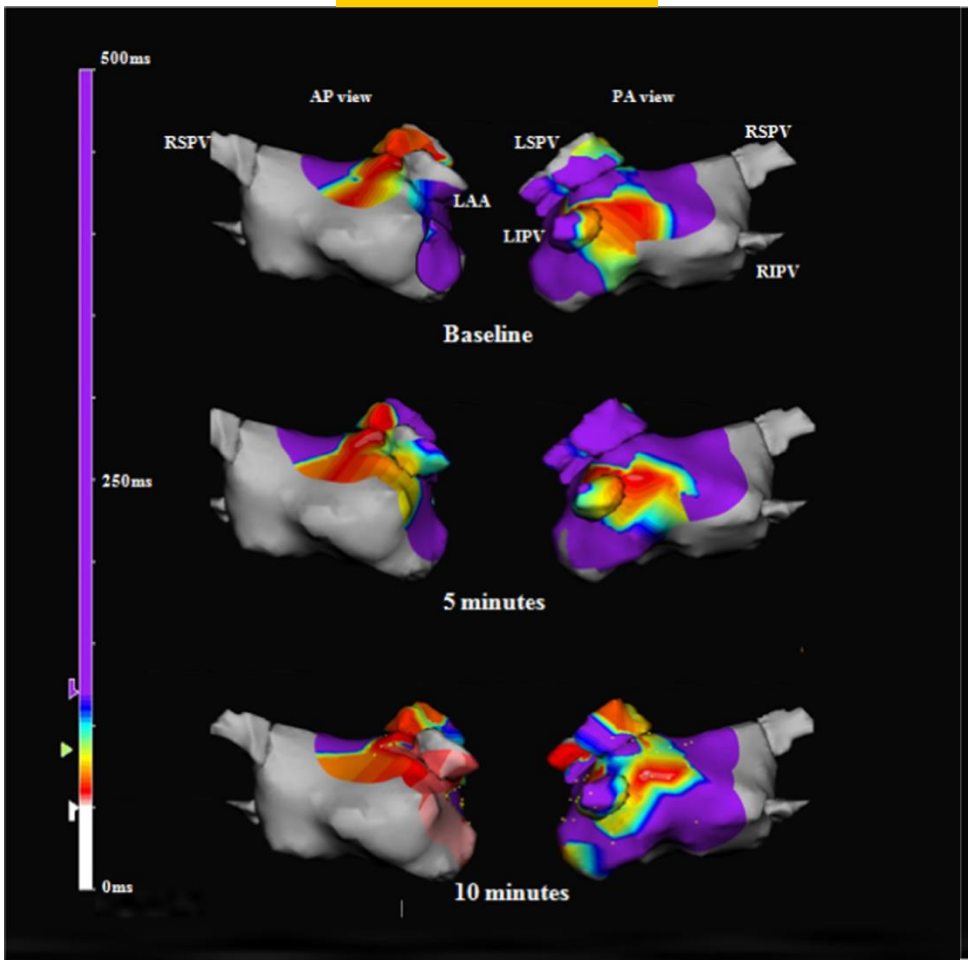
  Lin et al, JCE 2007; Nakagawa et al, Heart Rhythm 2006

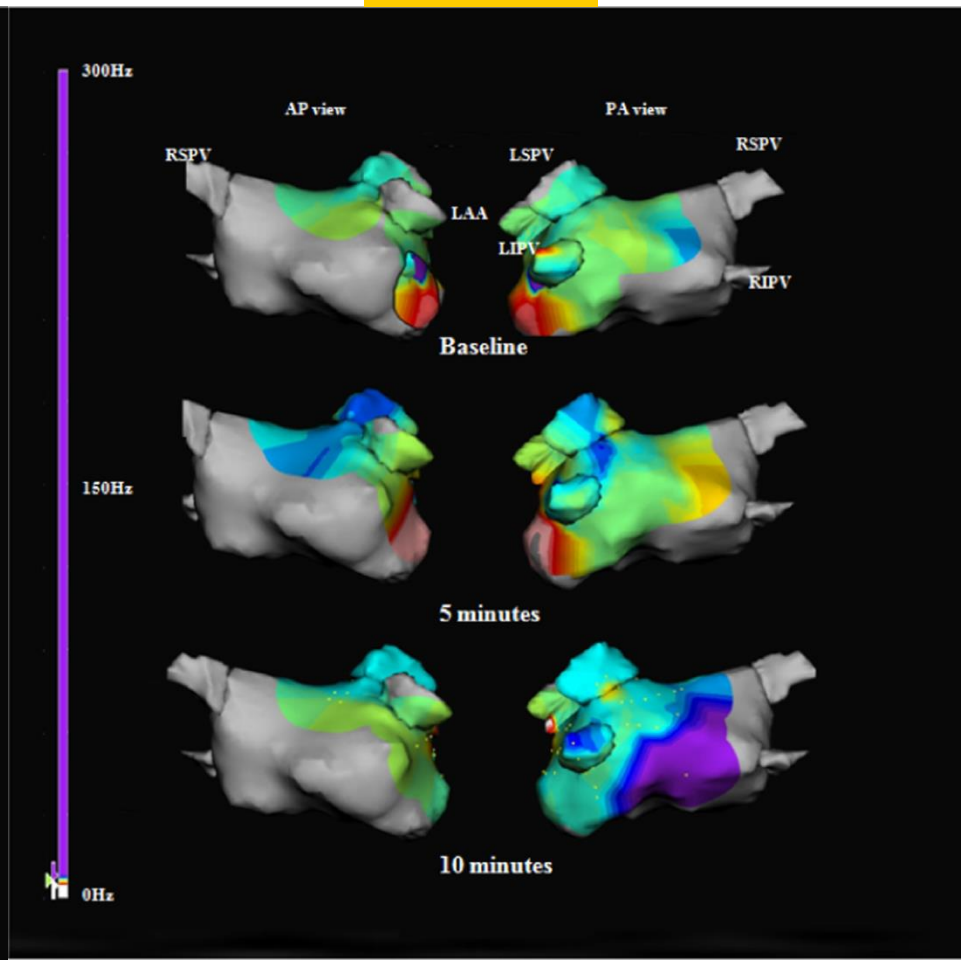
Spatial and temporal variability of the complex fractionated atrial electrogram activity and dominant frequency in human atrial fibrillation

Journal of Arrhythmia 31(2015)101–107

CFAE map

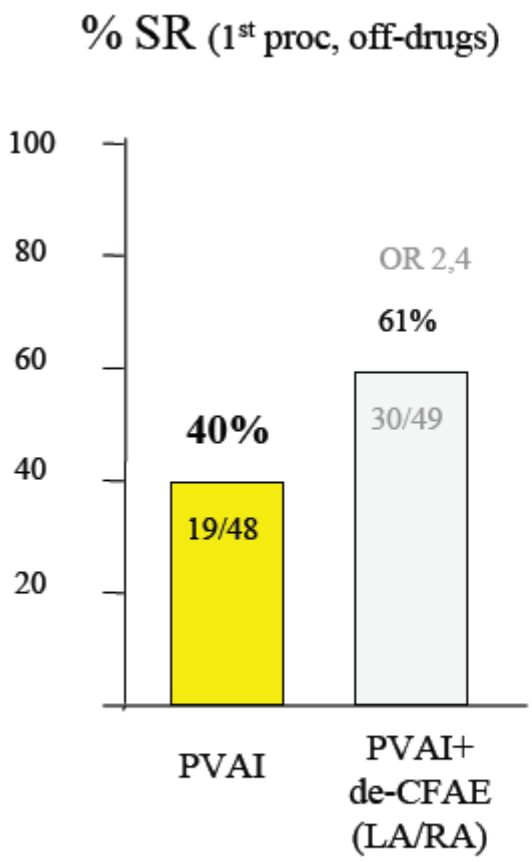
DF map



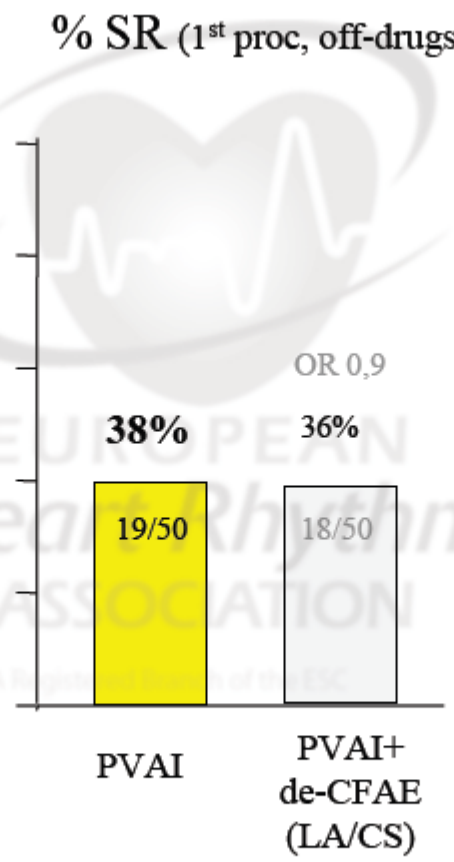


CFAE alanları kararlılık gösteriyor

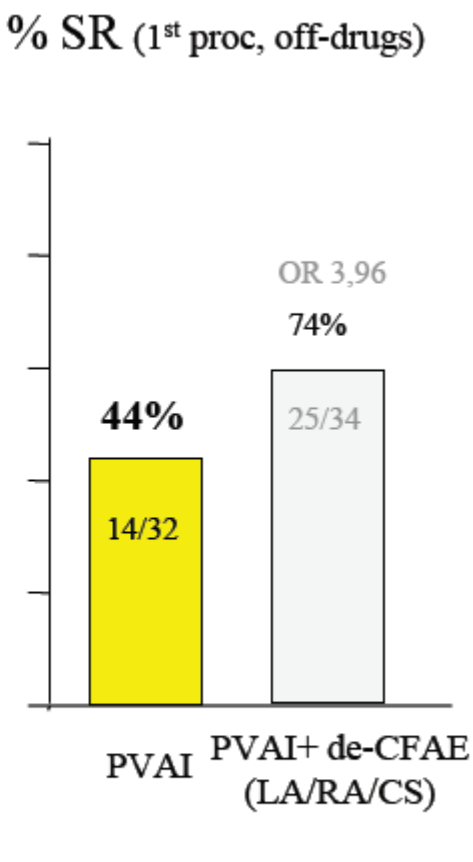
Uzun süreli persistan AF hastalarında veriler: CFAE



Elayi et al, HR 2008

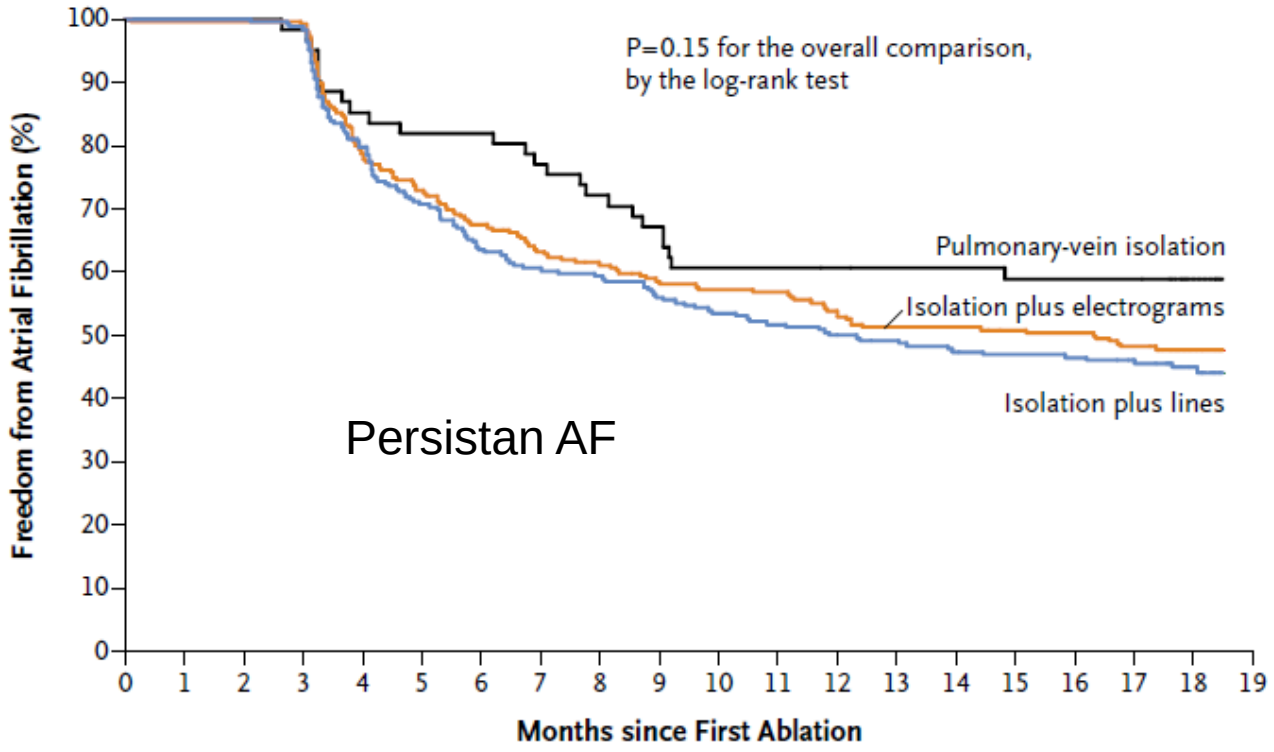


Oral et al, JACC 2009



Verma et al, EHJ 2010

STAR AF 2



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

n engl j med 2015 372;19

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

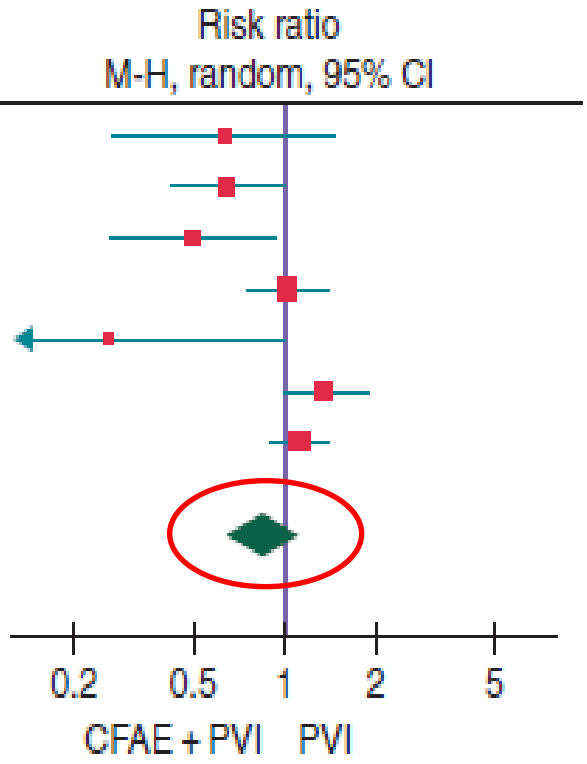
Paul A. Scott*, John Silberbauer, and Francis D. Murgatroyd

Europace 2015 Nov 10.

Study or subgroup	Weight	Risk ratio M-H, random, 95% CI	Year
Verma 2007	8.3%	0.64 [0.27, 1.47]	2007
Elayi	16.3%	0.64 [0.42, 0.98]	2008
Lin	11.8%	0.50 [0.27, 0.93]	2009
Oral	19.4%	1.03 [0.76, 1.39]	2009
Verma 2010	4.1%	0.26 [0.07, 1.00]	2010
Dixit	19.0%	1.39 [1.01, 1.90]	2012
Verma 2015	21.1%	1.13 [0.90, 1.42]	2015
Total (95% CI)	100.0%	0.86 [0.64, 1.16]	
Total events			

Heterogeneity: $\tau^2 = 0.10$; $\chi^2 = 20.15$, df = 6 ($P = 0.003$); $I^2 = 70\%$

Test for overall effect: $Z = 1.00$ ($P = 0.32$)

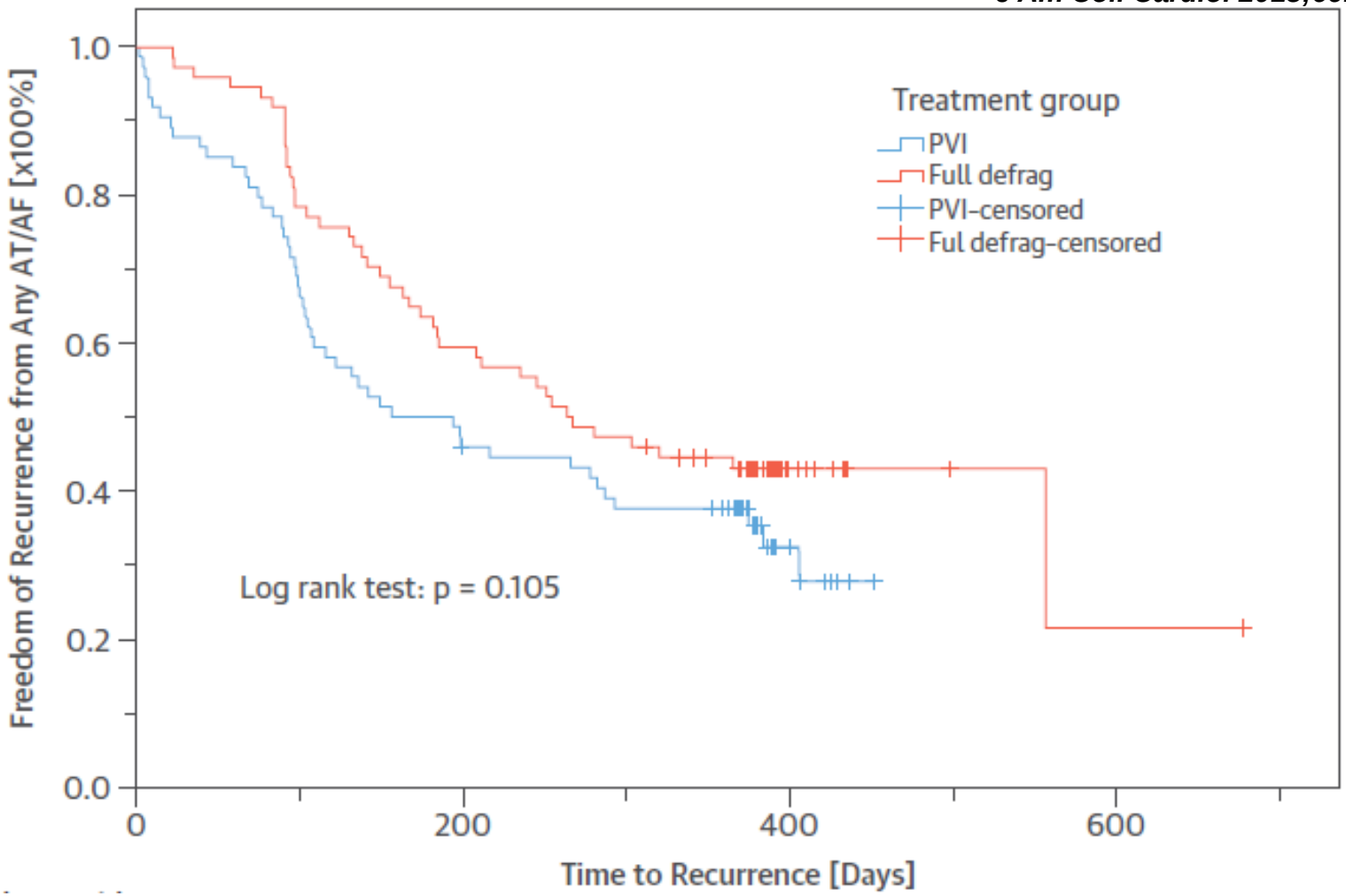


Pulmonary Vein Isolation Versus Defragmentation

The CHASE-AF Clinical Trial

Julia Vogler, MD,* Stephan Willems, MD,* Arian Sultan, MD,† Doreen Schreiber, MD,‡ Jakob Lüker, MD,† Helge Servatius, MD,§ Benjamin Schäffer, MD,* Julia Moser, MD,* Boris A. Hoffmann, MD,* Daniel Steven

J Am Coll Cardiol 2015;66:2743–52



Indices of bipolar complex fractionated atrial electrograms correlate poorly with each other and atrial fibrillation substrate complexity

Dennis H. Lau, MBBS, PhD, FHRS,[*†] Bart Maesen, MD,[*‡] Stef Zeemering, MSc,[*] Pawel Kuklik, PhD,[*†] Arne van Hunnik, BSc,[*] Theodorus A.R. Lankveld, MD,[*§] Elham Bidar, MD,[*‡] Sander Verheule, PhD,[*] Jan Nijs, MD,[‡] Jos Maessen, MD, PhD,[‡] Harry Crijns, MD, PhD,[§] Prashanthan Sanders, MBBS, PhD, FHRS,[†] Ulrich Schotten, MD, PhD[*]

Heart Rhythm 2015

1. *ICL:* It refers to the number of 70–120 ms intervals between
of AF. C
2. *ACI:* It r
successiv
ms. CFA
3. *SCI:* It re
tagged de
is definec
4. *CEA:* It
successive tagged deflections with a <50 ms interval and expressed as percentage of continuous activity. CFAE is defined by CEA ≥75%.
5. *CFE-m:* It measures the mean of time intervals between the marked deflections. CFAE is defined by CFE-m <120 ms.

Conclusion

Current bipolar algorithms correlate poorly with established AF substrate complexity measures and vary significantly in their classification of CFAE. Further work is needed to improve the current classification of CFAE to provide better identification of pathophysiological substrate sites relevant to the complex mechanisms sustaining AF.

EnSite NavX

COMPLEX FRACTIONATED ATRIAL ELECTROGRAM (CFAE)

Complex Fractionated Atrial Electrograms in Catheter Ablation of Atrial Fibrillation

Dead and Buried?

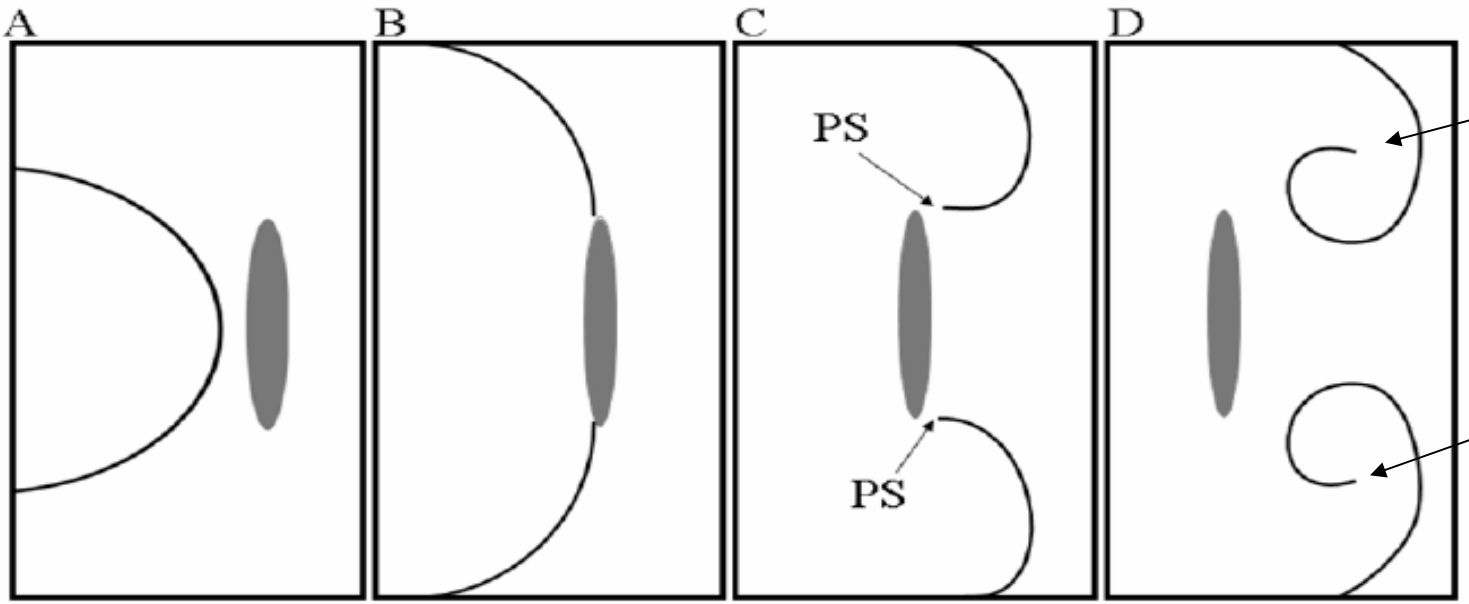
Aman Chugh, MD

Circ Arrhythm Electrophysiol. 2015;8:999-1001.

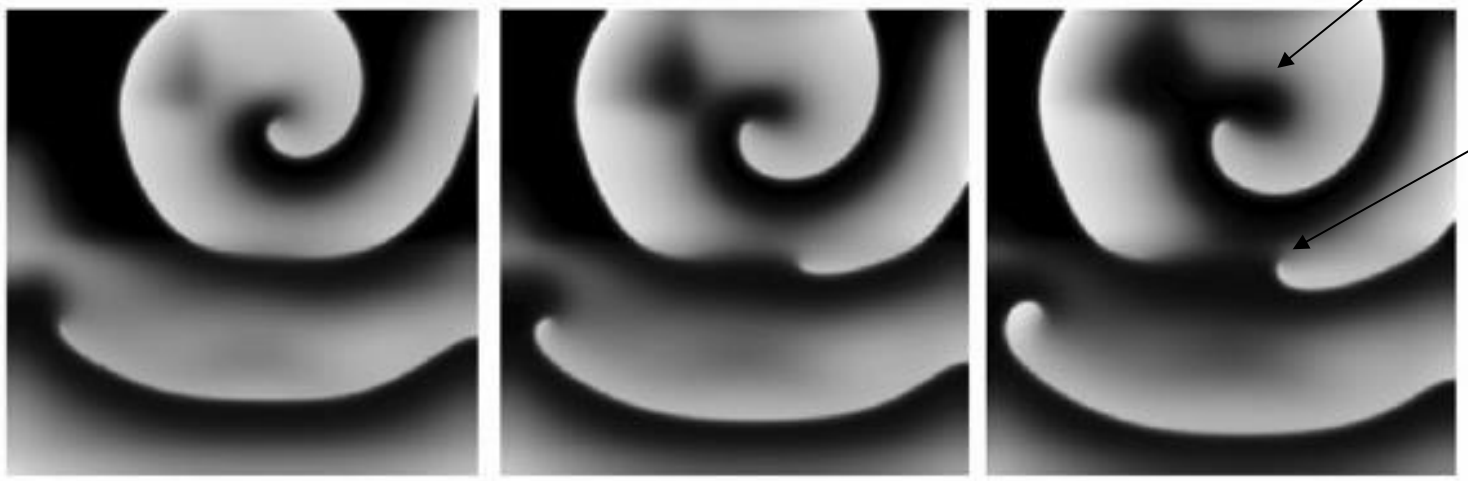
ablation. The elephant test as it applies to CFAEs ("I don't know how to describe a CFAE but I'll know it when I see it") is no longer sufficient. The current iteration of automated software designed to identify impactful fibrillatory electrograms has also been shown to be lacking. Yes, we all would welcome

CFAE rotor noktalarının etrafında olabilir?

Tetikleyici?➔Elek. Dalga➔ROTOR



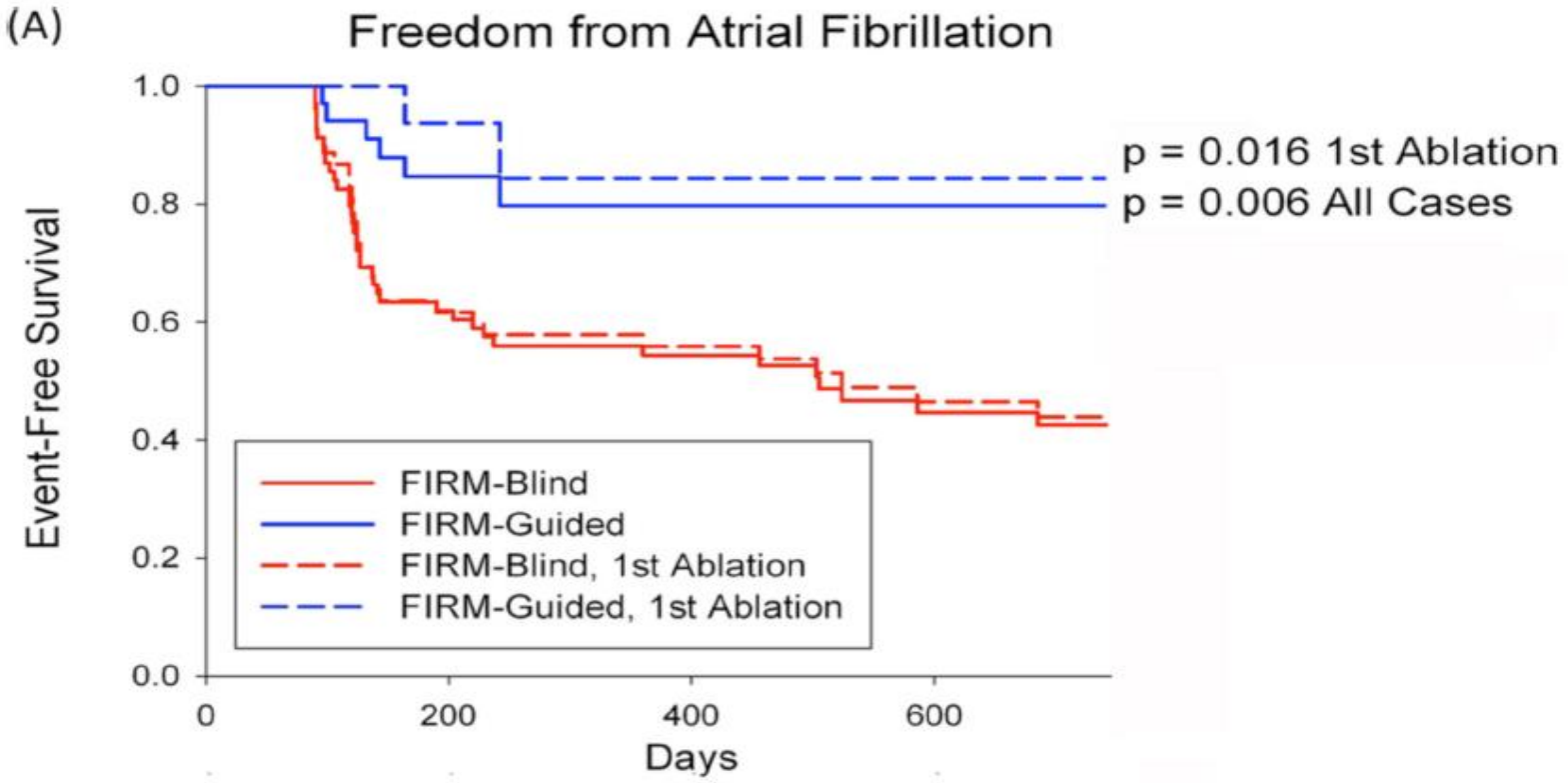
Rotor➔ Fibrilatuar iletim



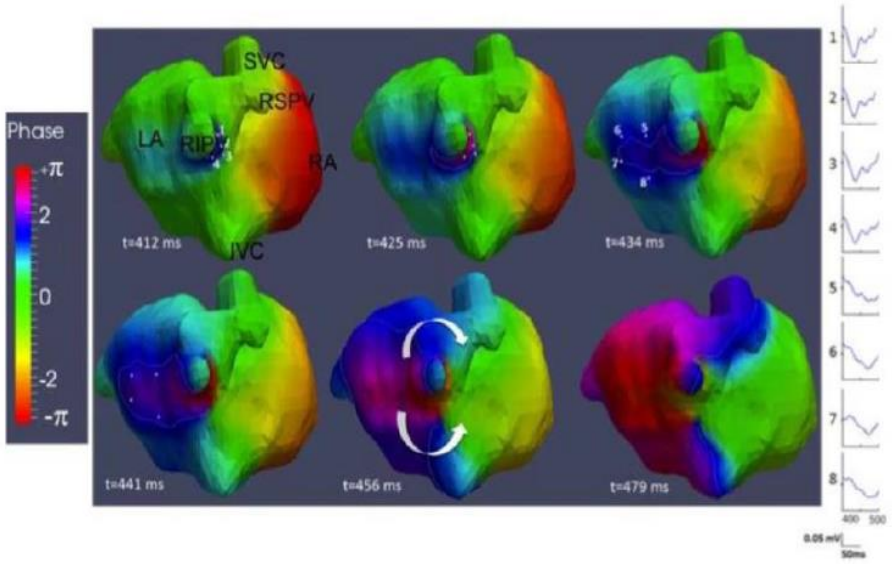
Treatment of Atrial Fibrillation By The Ablation Of Localized Sources:

The Conventional Ablation for Atrial Fibrillation With or Without Focal Impulse and Rotor Modulation (CONFIRM) Trial

Sanjiv M. Narayan, MD PhD FACC[1,3], David E. Krummen, MD FACC[1,3], Kalyanam Shivkumar, MD PhD FACC[4], Paul Clopton, MS[3], Wouter-Jan Rappel, PhD[2], and John M. Miller, MD FACC[5]

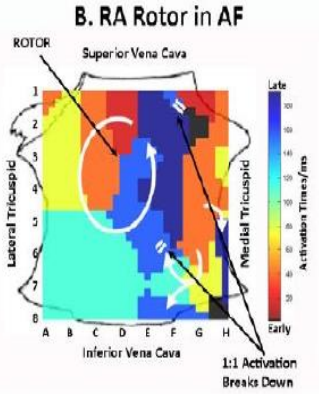


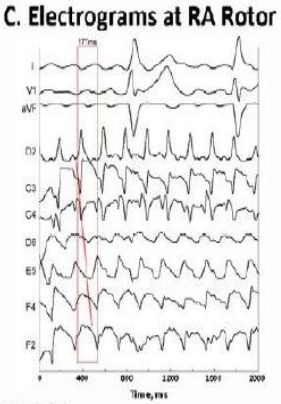
Body surface mapping

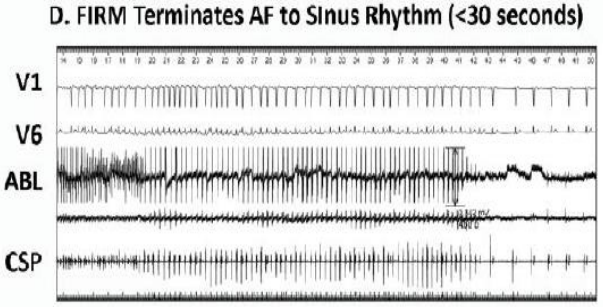


Haissaguerre et al. Circulation 2014

Focal impulse and rotor modulation (FIRM)





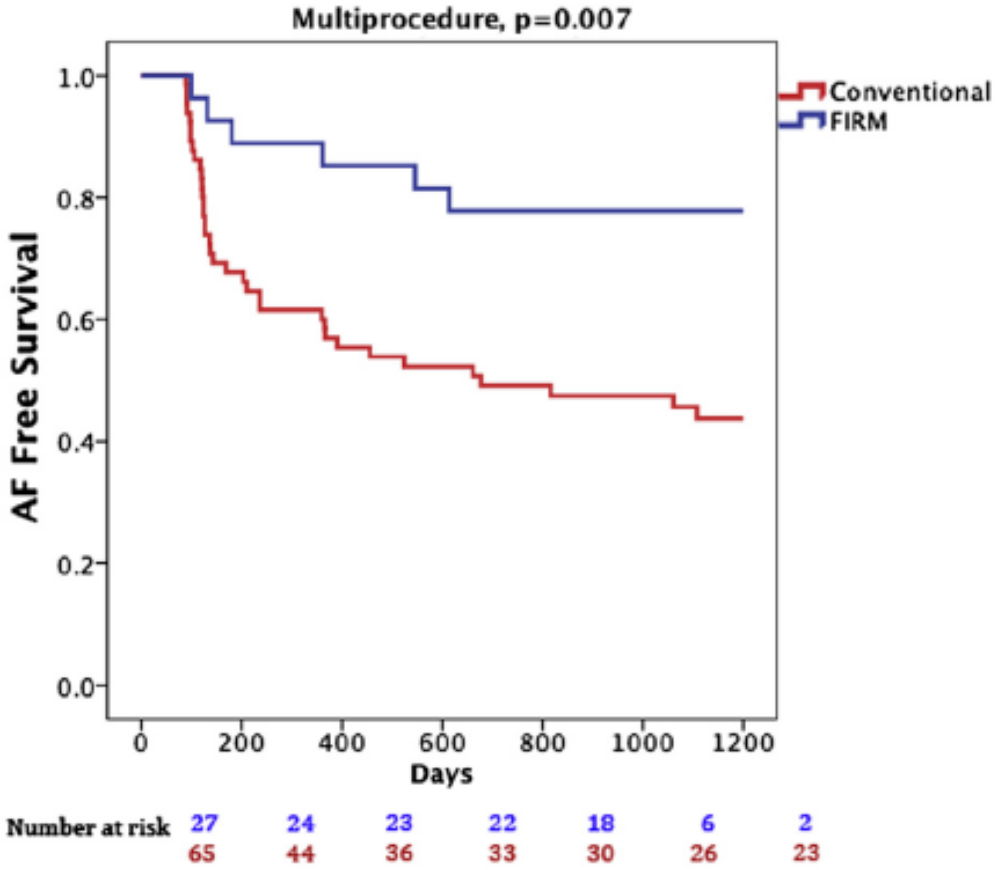


Narayan et al

J Cardiovasc Electrophysiol. 2012 May ; 23(5): 447–454.

Ablation of Rotor and Focal Sources Reduces Late Recurrence of Atrial Fibrillation Compared With Trigger Ablation Alone

Extended Follow-Up of the CONFIRM Trial (Conventional Ablation for Atrial Fibrillation With or Without Focal Impulse and Rotor Modulation)



J Am Coll Cardiol 2014;63:1761–8)

3 yıllık sonuçlar (% 70 persistan)

FIRM+PVI&PVI: % 77-% 38

Focal impulse and rotor modulation using the novel 64-electrode basket catheter: electrogram characteristics of human rotors

Tina Lin[1†*], Andreas Rillig[1†], Tudor Bucur[1], Andreas Metzner[1], Shibu Mathew[1],

EUROPEAN SOCIETY OF CARDIOLOGY®

Europace (2015) **17**, 1743–1744
doi:10.1093/europace/euv370

EDITORIAL

The elusive rotor electrogram footprint

José Jalife*

Center for Arrhythmia Research, University of Michigan, 2800 Plymouth Rd, Ann Arbor, MI 48109, USA

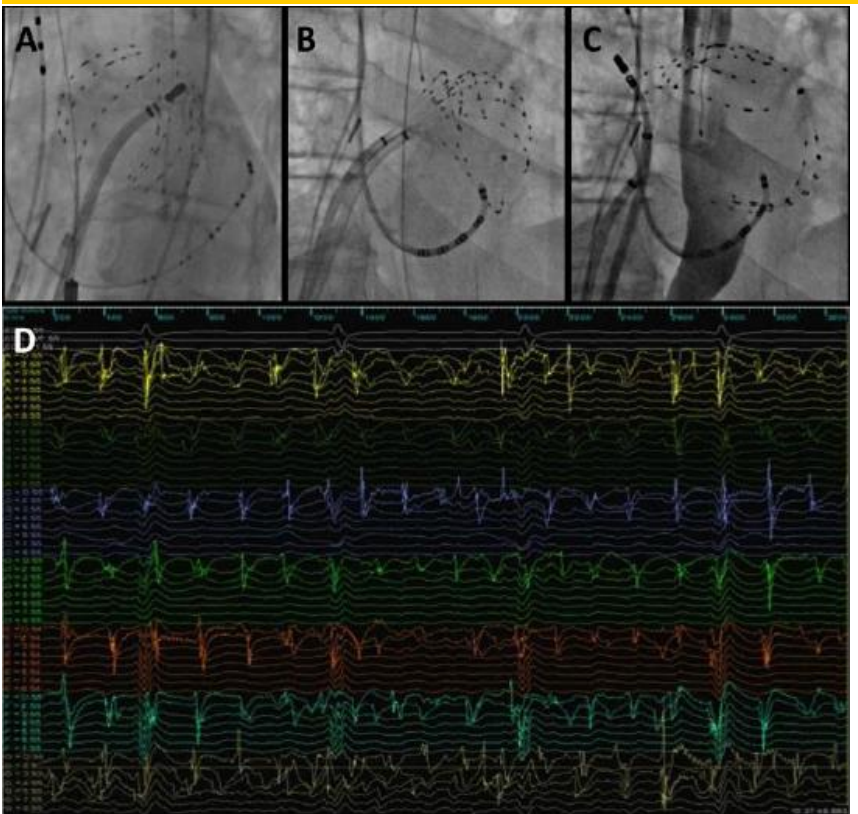
Karakteristik bir rotor EGM potansiyeli yok!

Quantitative Analysis of Localized Sources Identified by Focal Impulse and Rotor Modulation Mapping in Atrial Fibrillation

Peyman Benharash, MD*; Eric Buch, MD*; Paul Frank, MD; Michael Share, MD; Roderick Tung, MD; Kalyanam Shivkumar, MD, PhD; Ravi Mandapati, MD

Circ Arrhythm Electrophysiol. 2015;8:554-561

Toplam 24 hasta (% 50 pers.) FIRM ablasyon
19 hasta FIRM+PVI

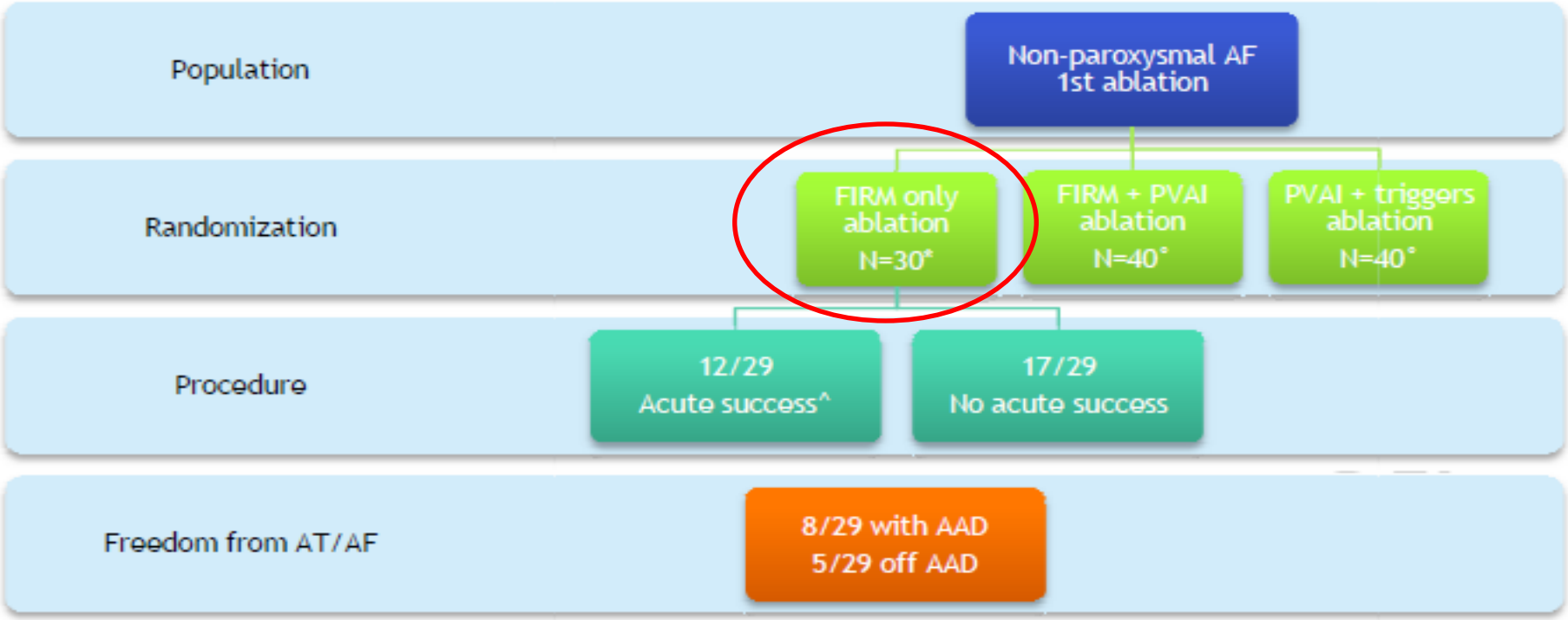


- Basket kateter haritalamada yetersiz
- Rotor alanlarının DF-SE açısından farklı değil
- FIRM rotor alanları EAM ile saptanamadı
- Rotor bölgelerinin ablasyonu AF term. % 17

Acute and early outcomes of FIRM-guided rotors-only ablation in patients with non-paroxysmal atrial fibrillation

FIRM-guided rotors-only ablation in non-paroxysmal AF

Heart Rhythm. 2015 Dec 17.



29 per. AF hasta➔ Sadece FIRM guided rotor ablasyonu

Acute and early outcomes of FIRM-guided rotors-only ablation in patients with non-paroxysmal atrial fibrillation

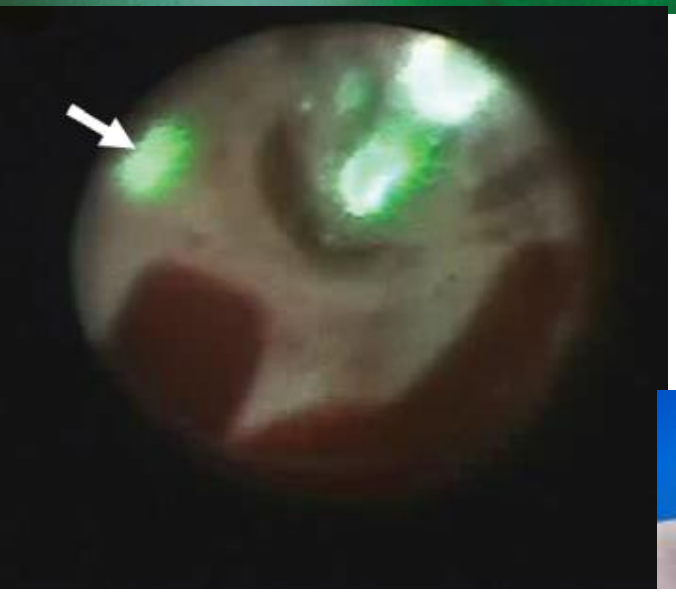
FIRM-guided rotors-only ablation in non-paroxysmal AF

Heart Rhythm. 2015 Dec 17.

- **Hasta başına ~4 rotor, %62' LA' da**
- **% 41 akut başarı (rotor abl)**
- **% 0 Sinüs ritmi, AFCL uzama % 7, AT % 34, DC % 100**
- **İşlem süresi-abl. süresi: 222±49-35±16 dk**
- **~6 aylık izlem AT/AF free % 17-28 (2 merkezde % 0)**

Sadece FIRM abl. kolu durduruldu

LAZER-BALON AF ABLASYONU



- Heart Light Endoscopic Ablation system CardioFocus inc.
- Endoskop ve lazer enerji veren fiber içeren 12 F balloon-based ablasyon kateteri
- Görerek anatomik ablasyon
- Lezyonlar arasında > % 30 overlap
- Noktasal ablasyon
- 8,5 W, 20 s lazer enerji

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
VOL. 66, NO. 12, 2015
© 2015 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
ISSN 0735-1097/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jacc.2015.07.036

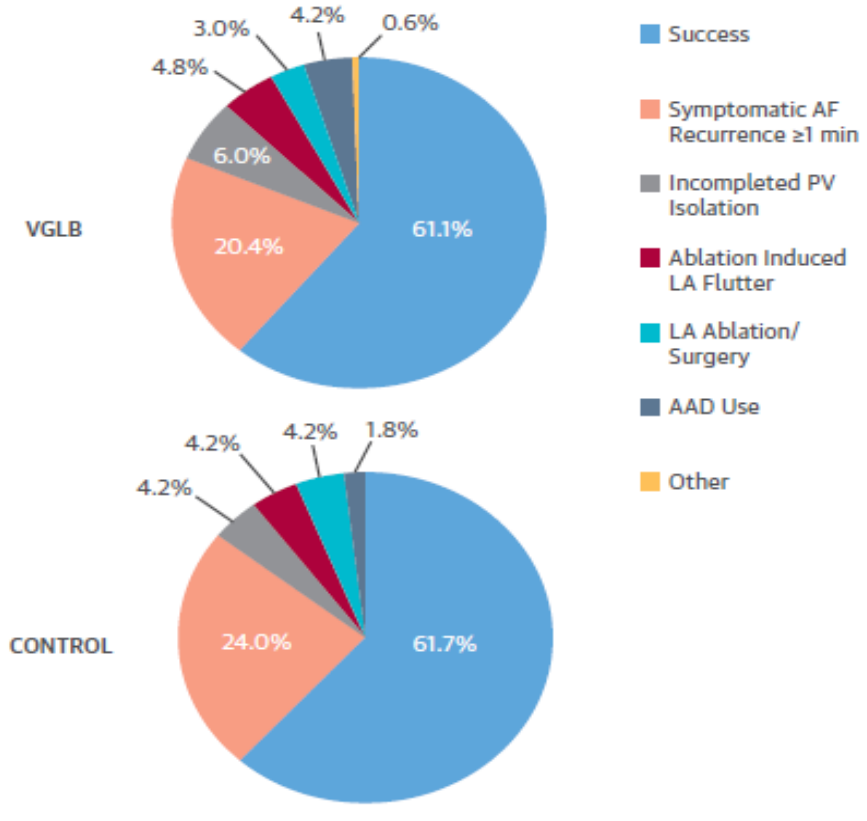
Pulmonary Vein Isolation Using the Visually Guided Laser Balloon

A Prospective, Multicenter, and Randomized Comparison to Standard Radiofrequency Ablation

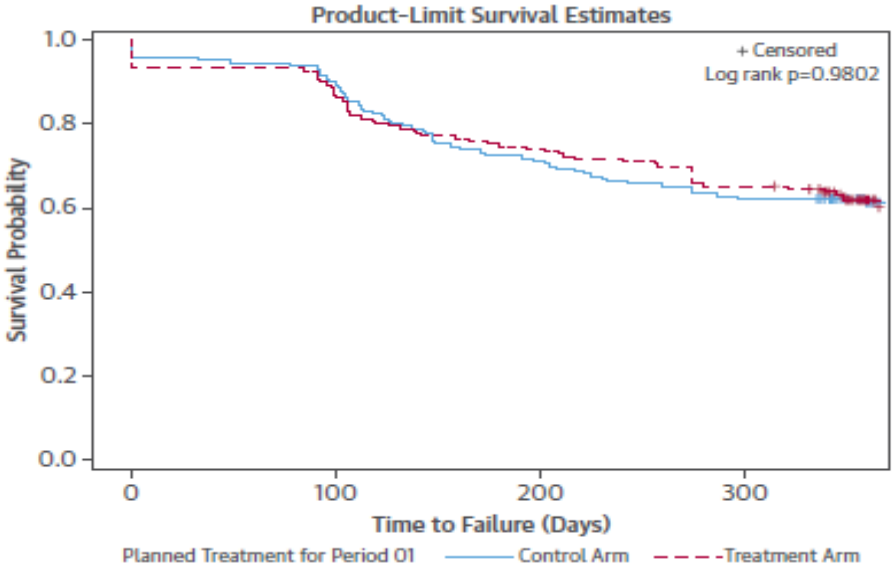
Srinivas R. Dukkipati, MD,* Frank Cuoco, MD,† Ilana Kutinsky, DO,‡ Arash Aryana, MD,§ Tristram D. Bahnson, MD,‖ Dhanunjaya Lakkireddy, MD,¶ Ian Woollett, MD,# Ziad F. Issa, MD,** Andrea Natale, MD,†† Vivek Y. Reddy, MD,* for the HeartLight Study Investigators

170 hasta VGLB, 172 hasta Thermo-Cool RF

Randomize, çok merkezli, prospektif



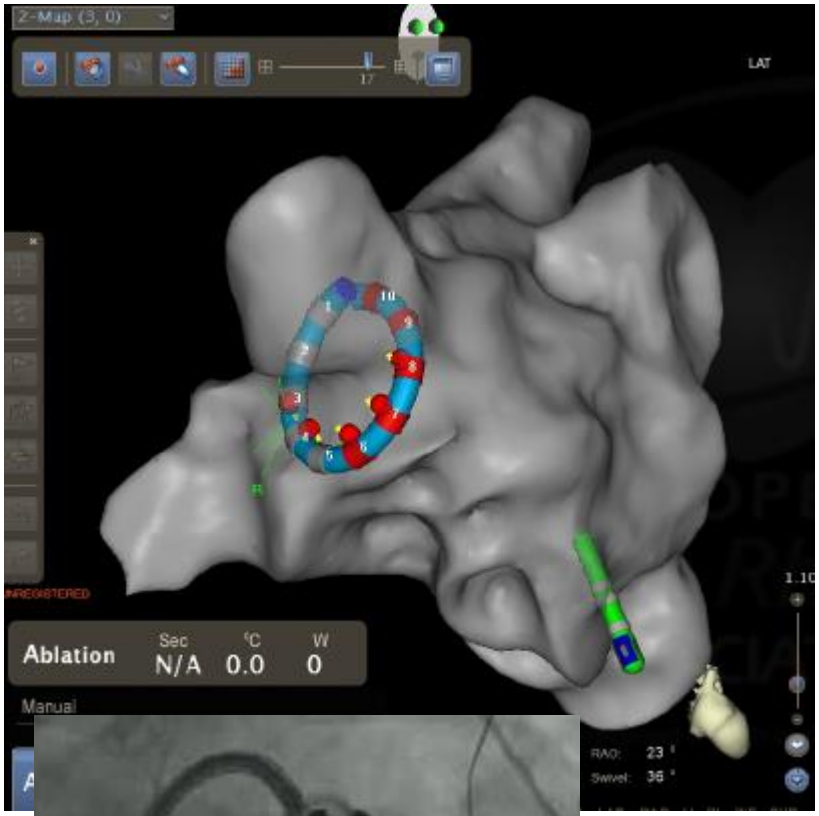
	VGLB (n = 170)	Control (n = 172)	p Value
Stroke	2 (1.2)	1 (0.6)	0.56
TIA	0 (0.0)	0 (0.0)	–
Cardiac tamponade, perforation, or significant effusion	2 (1.2)	3 (1.7)	0.66
Diaphragmatic paralysis	6 (3.5)	1 (0.6)	0.05
Atrio-esophageal fistula	0 (0.0)	0 (0.0)	–
PV stenosis >50%	0 (0.0)	5 (2.9)	0.03
Cardioversion for atrial arrhythmias	14 (8.2)	16 (9.3)	0.73
Major bleeding requiring transfusion	0 (0.0)	1 (0.6)	0.32
Myocardial infarction	0 (0.0)	0 (0.0)	–
Death	0 (0.0)	0 (0.0)	–
Total PAEs	24 (14.1)	27 (15.7)	NS
Total PAE rate*	20 (11.8)	25 (14.5)	

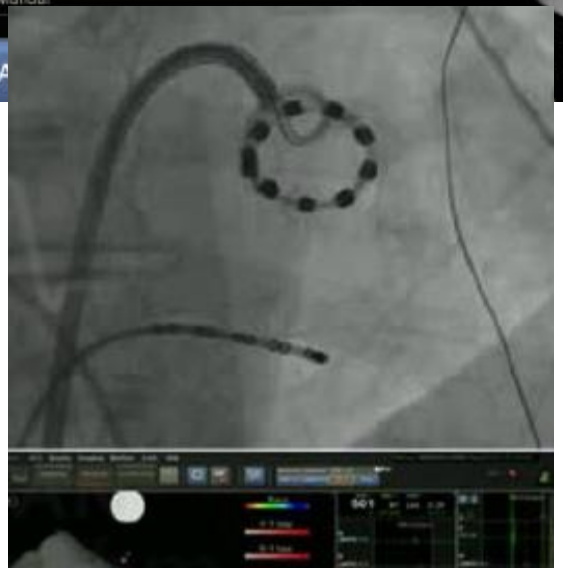


Akut PVI > % 95 VGLB
Stroke % 1,2 VGLB
SR %61(1 yıl)
DP % 3,5

VGLB 1 yıllık izlemde en az standart RF ablasyon kadar etkili ve güvenli

nMARQ



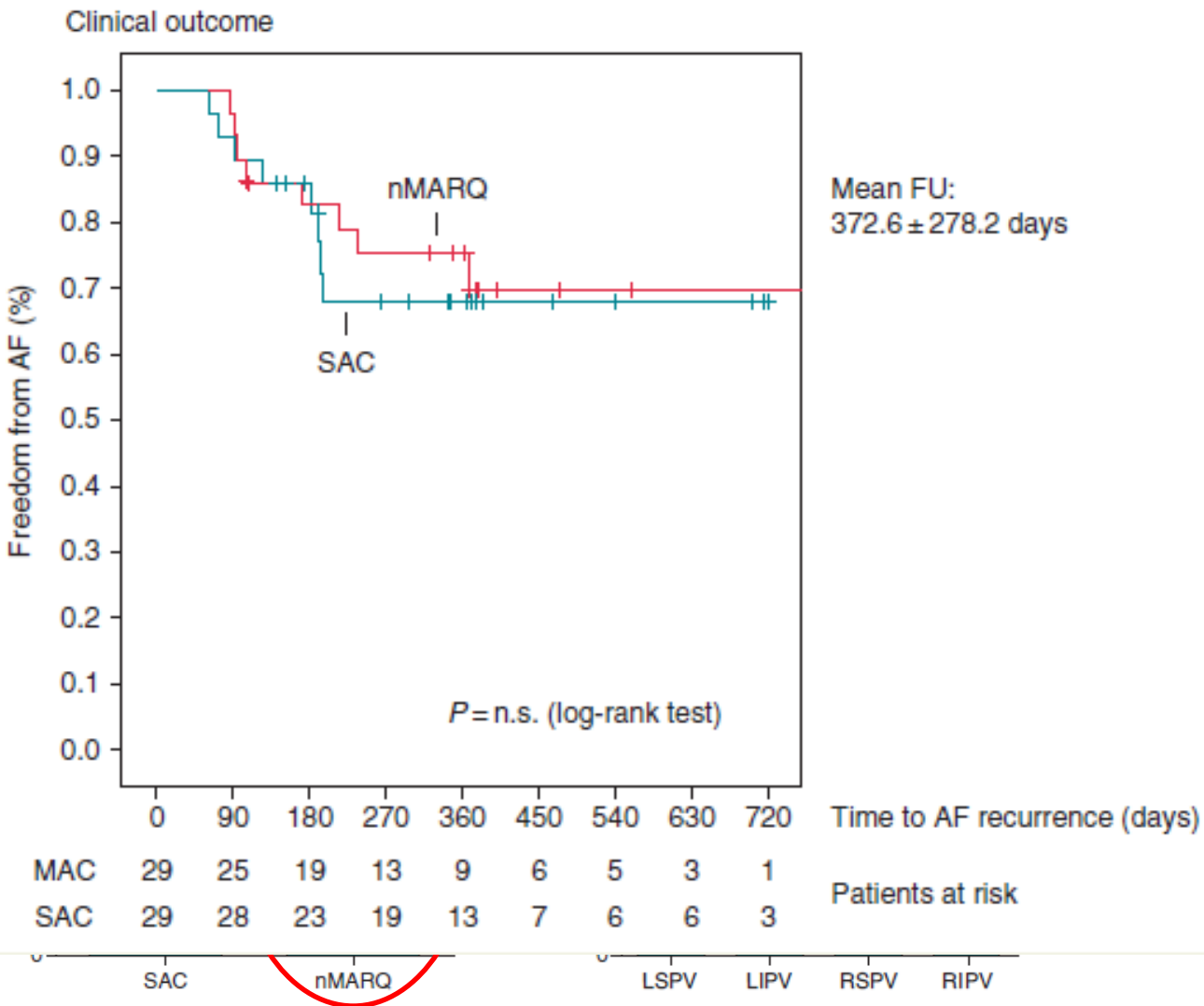


- Steerable Sheath (Agilis 8.5F, Channel 9.5F)
- Adjustable circular array (min20, max35mm)
- 10 platinum electrodes
- Each electrode:
  - A distal thermocouple
  - A hole for irrigation
- Electrode size: 3mm
- Electrodes spacing: 4mm
- Steering knob (handle) allowing unidirectional curve
- Carto3 system (FAM via nMarq)
- 5 bipolar recordings
- Generator allowing bipolar or unipolar ablation to all or selected electrodes
- RF power can be modified for each electrode (max 25W)
- T° controlled mode (1min)
- Flush rate 60ml/min
- Tissue Connect

One-year clinical outcome after ablation with a novel multipolar irrigated ablation catheter for treatment of atrial fibrillation: potential implications for clinical use

Europace. 2016 Jan 11

tz F. Sinner[1],
astian Clauss[1,4],



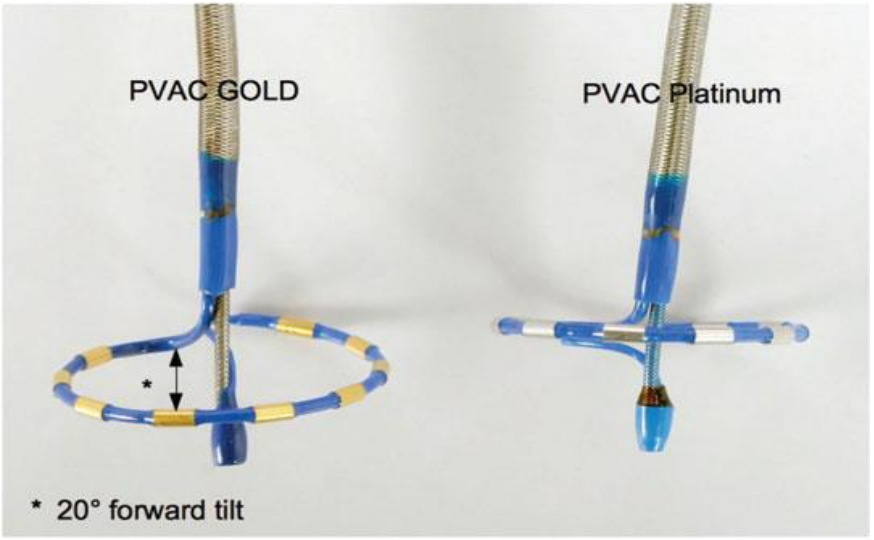
nMARQ-29 RF
ost LA'da max. 18 W
k TS ponk.
k sirküler kateter yok

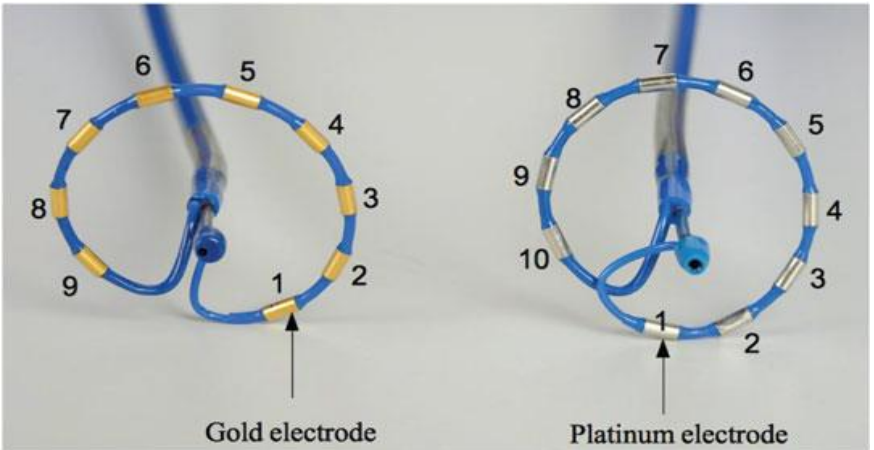
AF free % 72

Data on procedural handling and complications of pulmonary vein isolation using the pulmonary vein ablation catheter GOLD®

Patrick Leitz*, Fatih Güner, Kristina Wasmer, Philip Foraita, Christian Pott, Dirk Georg Dechering, Stephan Zellerhoff, Simon Kochhäuser, Philipp Sebastian Lange, Lars Eckardt, and Gerold Mönnig

Europace. 2015 Dec 23





128 hasta PVAC GOLD AF abl
CHADVASC: 1,7

	PVAC GOLD® (*n* = 128)
Total bleeding	3 (2.3%)
Minor bleeding, *n* (%)	1 (0.8%)
Major bleeding, *n* (%)	2 (1.6%)
Haemoglobin loss >2 g/dL, *n* (%)	0
Surgical intervention, *n* (%)	2 (1.6%)
Transient ischaemic attack, *n* (%)	1 (0.8%)
Transitoric ST-elevation, *n* (%)	0
Pericardial effusion, *n* (%)	2 (1.6%)
Pericardiocentesis, *n* (%)	0
Fever, *n* (%)	1 (0.8%)
Death, *n*	0
Major safety endpoints	3 (2%)
Total safety endpoints, *n* (%)	7 (5.4%)

Safety, efficacy, and clinical applicability of pulmonary vein isolation with circular multi-electrode ablation systems: PVAC® vs. nMARQ™ for atrial fibrillation ablation

Avishag Laish-Farkash[1,2*], Vladimir Khalameizer[1,2], Evgeny Fishman[1,2], Ornit Cohen[1,2], Chaim Yosefy[1,2], Iris Cohen[1,2], and Amos Katz[1,2]

Europace. 2015 Nov 20

- 1 yıl sonunda AF free PVAC/nMARQ: % 79/80, 2. işlem: % 88/87
- İşlem süresi PVAC/nMARQ: 94/88 dk
- nMARQ geniş LA ve PV'lerde daha etkili
- 3-D mapping nMARQ için avantaj
- Her iki yöntemin etkinlik ve güvenliği benzer

TEŞEKKÜRLER