# AF Ablasyonunda Yeni Yayınlanan Çalışmalar

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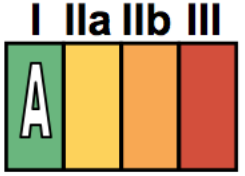
Kardiyoloji Anabilim Dalı

# Atriyal Fibrilasyon Ablasyonu



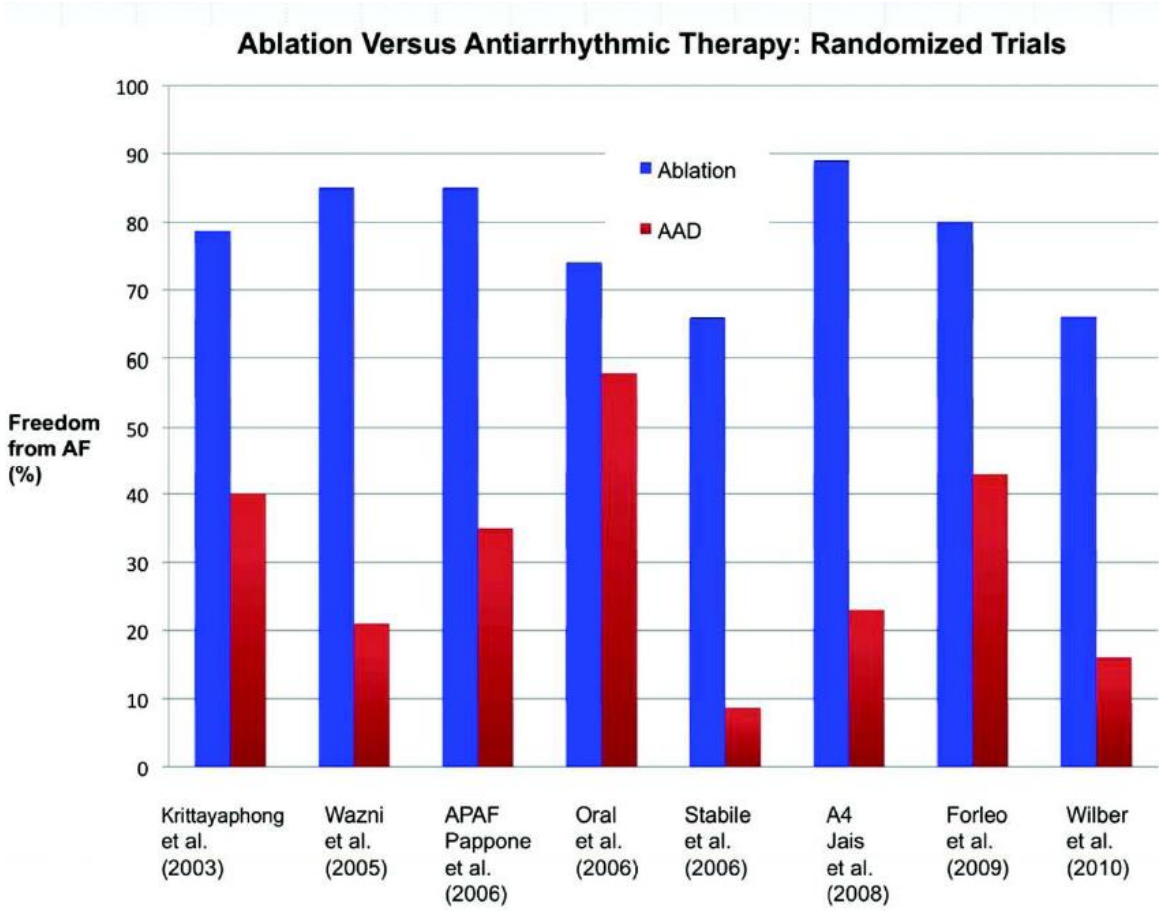

- Ritm kontrolü planlanan
- En az bir klas I ya da III antiaritmik ilaca refrakter veya intoleransı olan
- Paroksismal AF hastaları

Bu hastalarda, işlem öncesi hastaların prosedürel risk ve sonuçlarının bireysel olarak değerlendirilmesi de Sınıf I endikasyon

**NEDEN??**

**2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation**

# Kateter ablasyon vs antiaritmik ilaçları karşılaştıran ilk randomize kontrollü çalışmaların özeti



# Neden yeni çalışmaların sonuçlarına ihtiyacımız var ?

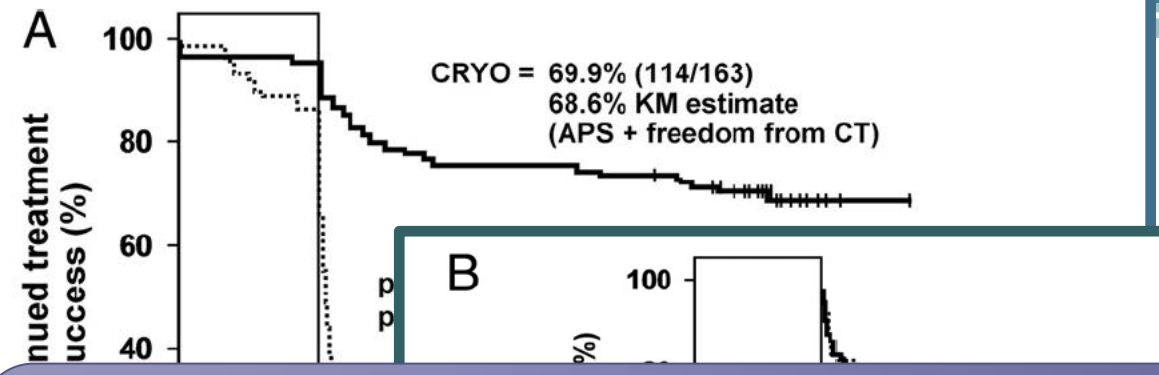
- En kompleks girişimsel işlemlerden biri
- Transseptal kateterizasyon
- Pulmoner ven çevresinde multipl lezyonlar
- Nüks riski
- Antikoagülasyon
- Başarı oranları (persistan AF?)
- Tek merkezli çalışmalar ve kayıtlar
- Başarının standartlaşmış bir tanımı yok

# Cryoballoon Ablation of Pulmonary Veins for Paroxysmal Atrial Fibrillation

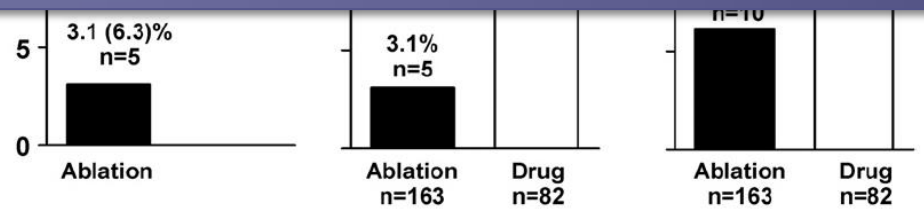
## First Results of the North American Arctic Front (STOP AF) Pivotal Trial

- Çalışmaya son iki ayda ikiden fazla paroksismal AF atağı geçiren en az bir ilacın başarısız olduğu hastalar alınıyor
- 245 hasta, 163 hasta kriyo, 82 hasta AAT
- 31 kriyoablasyon hastasına blanking periyodda tekrar ablasyon
- 65 antiaritmik tedavi alan hasta kriyo grubuna crossover

JACC 2013;61:1713-23




- 1 veya daha fazla antiaritmik tedaviye rezistan hastalarda rekürren semptomatik AF önlemede Kriyobalon ablasyonun etkili olduğu STOP-AF çalışmasında gösterilmiştir
- Bu çalışmada ciddi olumsuz olaylar oranı düşük olmasına rağmen, minor olumsuz olaylar gözlenmiştir.




All serious adverse events: cryoablation 12.3%; drug Rx 14.6% P=0.69

# PAF'ta ilaç denemeden ablasyon

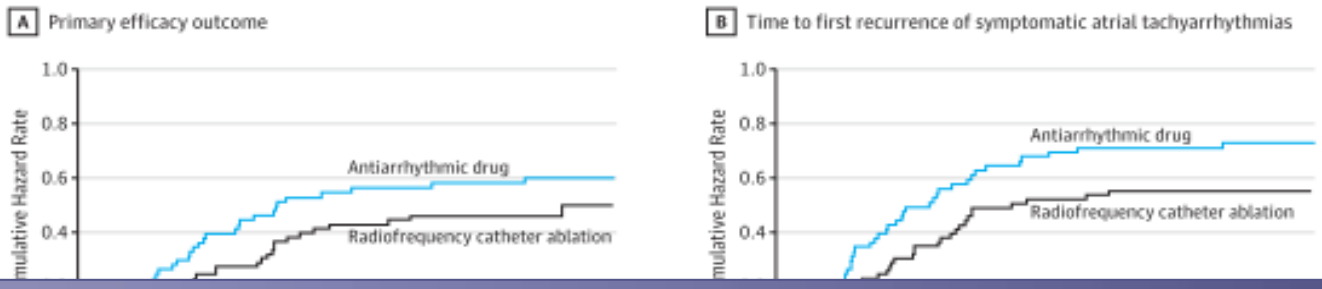
Original Investigation

## Radiofrequency Ablation vs Antiarrhythmic Drugs as First-Line Treatment of Paroxysmal Atrial Fibrillation (RAAFT-2)
### A Randomized Trial

Carlos A. Morillo, MD, FRCPC; Atul Verma, MD, FRCPC; Stuart J. Connolly, MD, FRCPC; Karl H. Kuck, MD, FHRS; Girish M. Nair, MBBS, FRCPC; Jean Champagne, MD, FRCPC; Laurence D. Sterns, MD, FRCPC; Heather Beresh, MSc; Jeffrey S. Healey, MD, MSc, FRCPC; Andrea Natale, MD; for the RAAFT-2 Investigators

- PAF, daha önce ilaç tedavisi verilmemiş 127 hasta antiaritmik tedavi (AAT) veya ablasyona randomize, 24 ay takip
- P.S.N. semptomatik veya asemptomatik, 30 sn'den daha uzun süren, dokumante edilmiş atriyal taşikardi
- S.S.N. Semptomatik atriyal taşikardi ve hayat kalitesi

Figure 2. Kaplan-Meier Curves of Time to First Recurrence of Any Atrial Tachyarrhythmias (A) and Time to First Recurrence of Symptomatic Atrial Tachyarrhythmias (B)




- Daha önce antiaritmik tedavi kullanmayan PAF hastalarında rekürren semptomatik AF önlemede Kriyobalon ablasyonun antiaritmik ilaç tedavisine göre etkili olduğu RAAFT-2 çalışmasında gösterilmiştir.

hycardia (recurrent episodes model;
unt> = 1)

HR, hazard ratio.

[a] eFigure 2 in the Supplement.

Original Investigation

# Association of Atrial Tissue Fibrosis Identified by Delayed Enhancement MRI and Atrial Fibrillation Catheter Ablation
## The DECAAF Study

Nassir F. Marrouche, MD; David Wilber, MD; Gerhard Hindricks, MD; Pierre Jais, MD; Nazem Akoum, MD; Francis Marchlinski, MD; Eugene Kholmovski, PhD; Nathan Burgon, BSc; Nan Hu, PhD; Lluis Mont, MD; Thomas Deneke, MD; Mattias Duytschaever, MD; Thomas Neumann, MD; Moussa Mansour, MD; Christian Mahnkopf, MD; Bengt Herweg, MD; Emile Daoud, MD; Erik Wissner, MD; Paul Bansmann, MD; Johannes Brachmann, MD

- **325 günde rekürren aritmi**

Kateter ablasyon yapılan AF hastalarında MRI ile saptanan atriyal fibrozis  rekürren aritmi ile ilişkili

- **475 günde rekürren aritmi**

  Evre 1 fibrozis % 15.3

  Evre 2 fibrozis % 35.8

  Evre 3 fibrozis % 45.9

  Evre 4 fibrozis % 69.4

JAMA 2014;311:498–

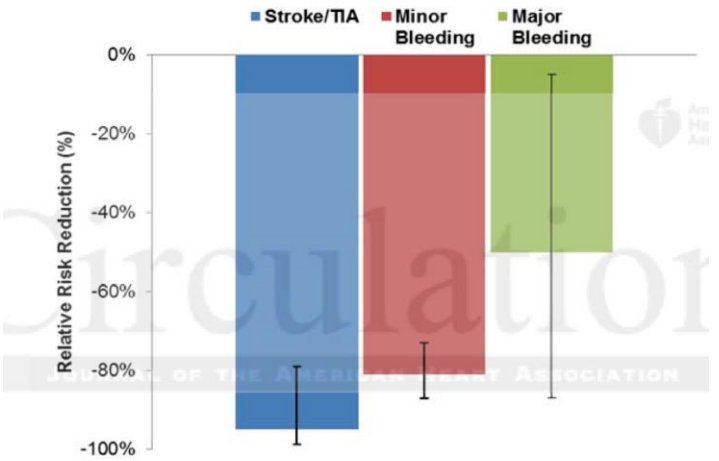
# Periprocedural Stroke and Bleeding Complications in Patients undergoing Catheter Ablation of Atrial Fibrillation with Different Anticoagulation Management: Results from the "COMPARE" Randomized Trial

RF pulmoner ven izolasyonu ile AF ablasyon, CHADS2 skoru ≥1

İşlemden önceki son 3-4 hafta içinde INR'si 2-3 arasında olan 1584 hasta

Hastalar warfarin kesilmesi veya warfarin devam gruplarına randomize

**Warfarin altında işlem yapıldığında tromboemboli riskinde dramatik azalma ve kanama riskinde de azalma**




Circulation. 2014 Jun 24;129(25):2638-44

# AMIO-CAT çalışması: AF ablasyonu sonrası kısa süreli amiodaron

## Recurrence of arrhythmia following short-term oral AMIOdarone after CATheter ablation for atrial fibrillation: a double-blind, randomized, placebo-controlled study (AMIO-CAT trial)

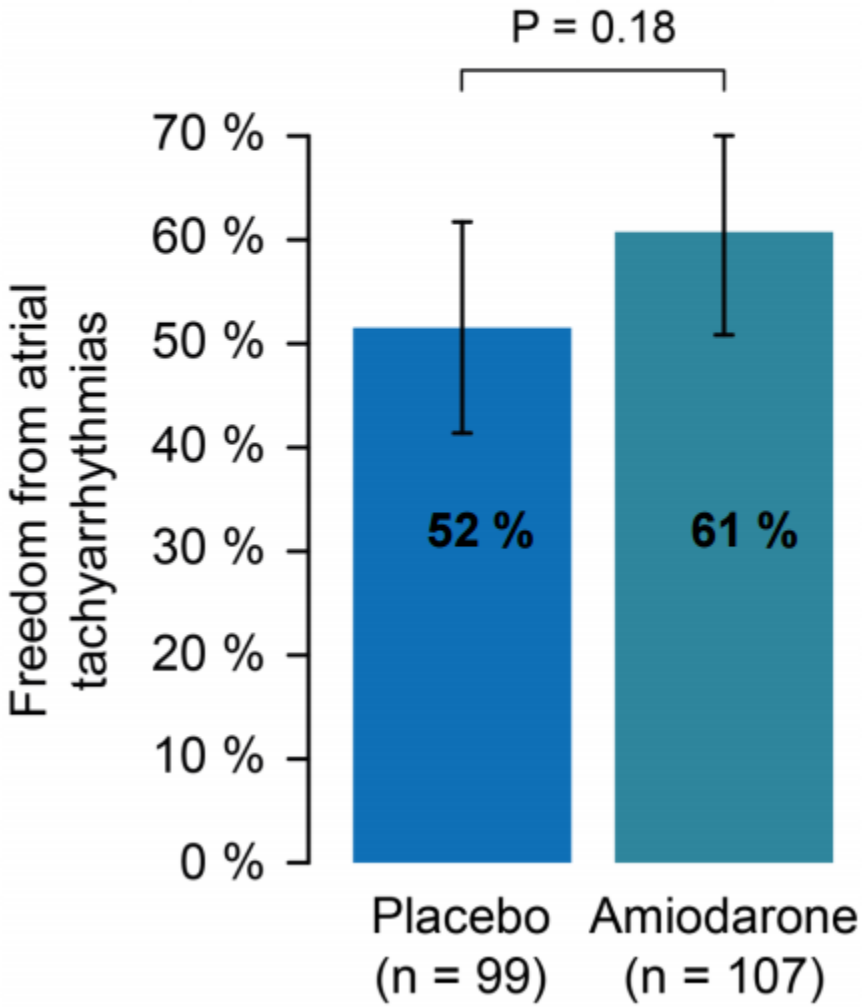
Stine Darkner[1]*, Xu Chen[1], Jim Hansen[2], Steen Pehrson[1], Arne Johannessen[2], Jonas Bille Nielsen[1], and Jesper Hastrup Svendsen[1,3,4]

- AF ablasyonu uygulanan 212 hasta, 8 haftalık amiodaron vs plasebo
- Primer sonlanım kör dönemden sonraki (ilk üç aydan sonra), 30 saniyeden daha uzun süren atriyal taşiaritmi

Eur Heart J. 2014 Dec 14;35(47):3356-64.

# Primary endpoint

## Freedom from AF/AT at 6-month follow-up




**Completed final Holter**

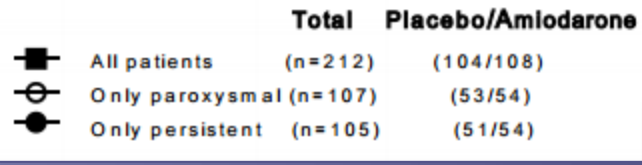
**Off AADs**

- except 1 patient (amiodarone group) unwilling to stop amiodarone initiated during Blanking period

*Darkner et al. Eur Heart J 2014; published today*

# Secondary endpoints

## AF/AT related hospitalizations and cardioversions within the blanking period



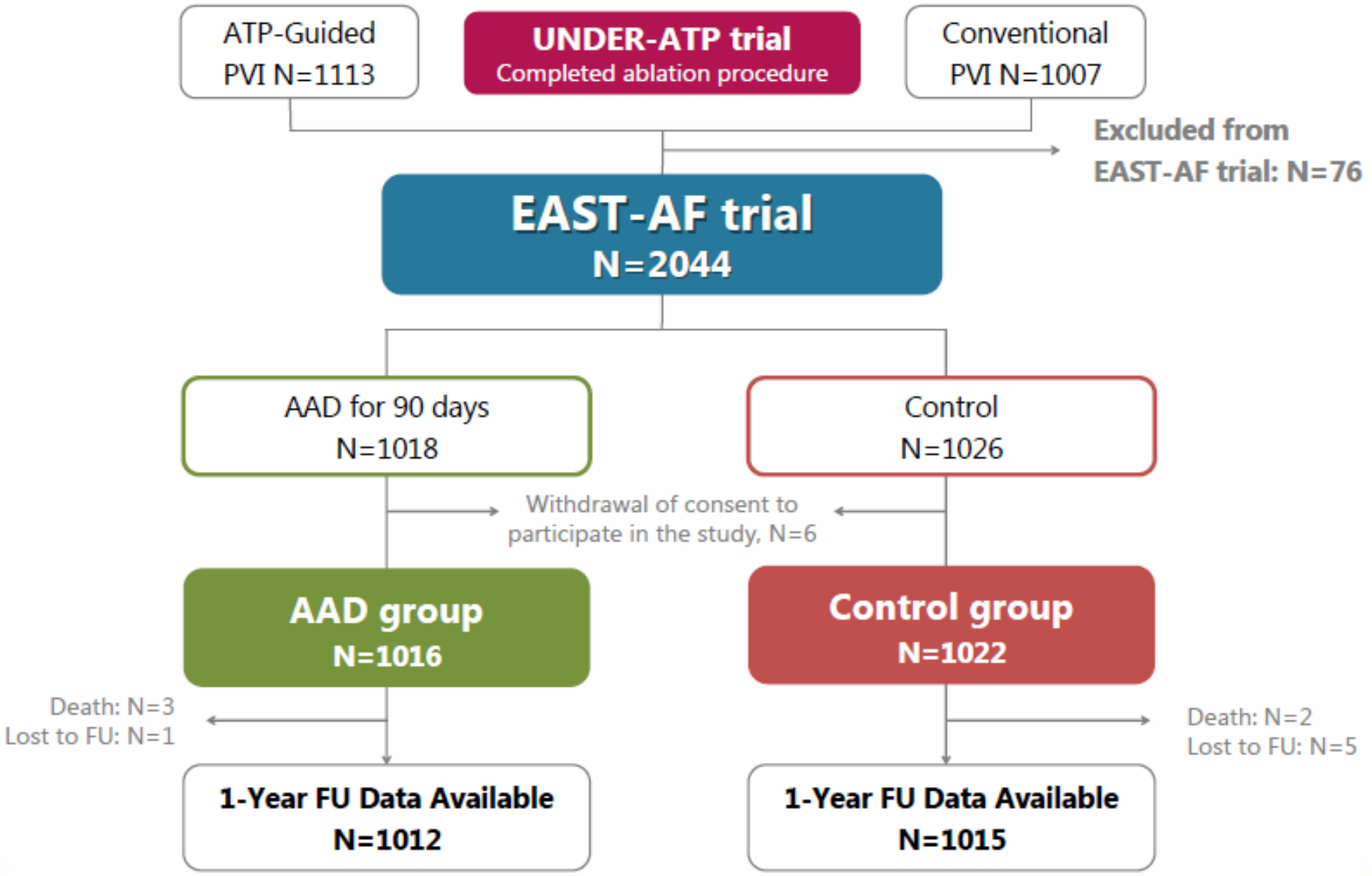

- **AF ablasyonu sonrası kısa süreli amiodaron tedavisi, kör dönemdeki atriyal taşiaritmi sıklığında azalma sağlasa da uzun dönem atriyal taşiaritmi rekürrensi üzerine etkili değil**

# Efficacy of Antiarrhythmic Drugs Short-Term Use After Catheter Ablation for Atrial Fibrillation trial


AF ablasyonu sonrası 90 günlük antiaritmik kullanımı uzun dönem klinik sonuçlarda iyileşmeye yol açacak şekilde erken aritmi rekürrens insidansını ve sol atrium reverse remodelingi azaltabilir mi?

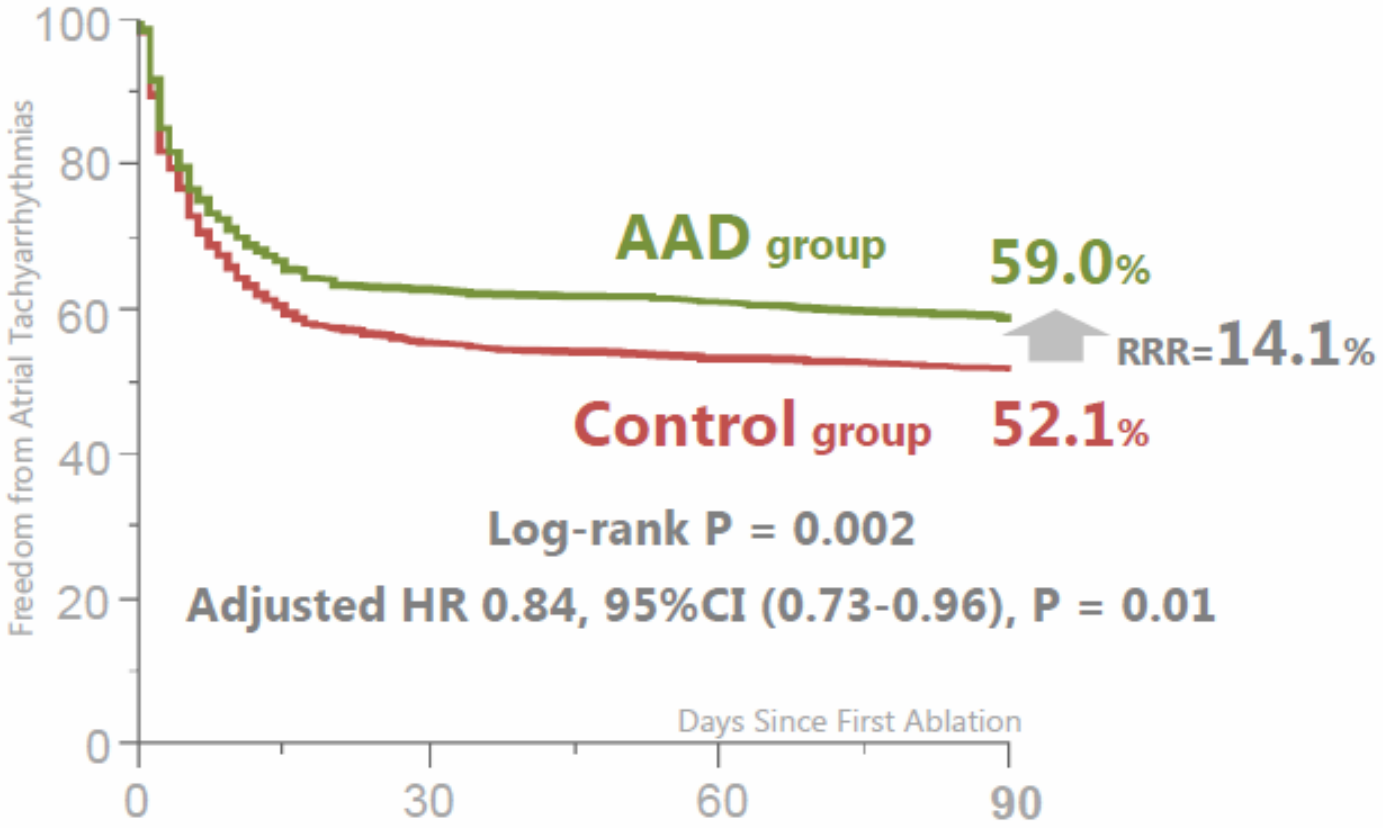
Eur Heart J. 2015 Sep 28

# Patient flowchart



# Secondary endpoint

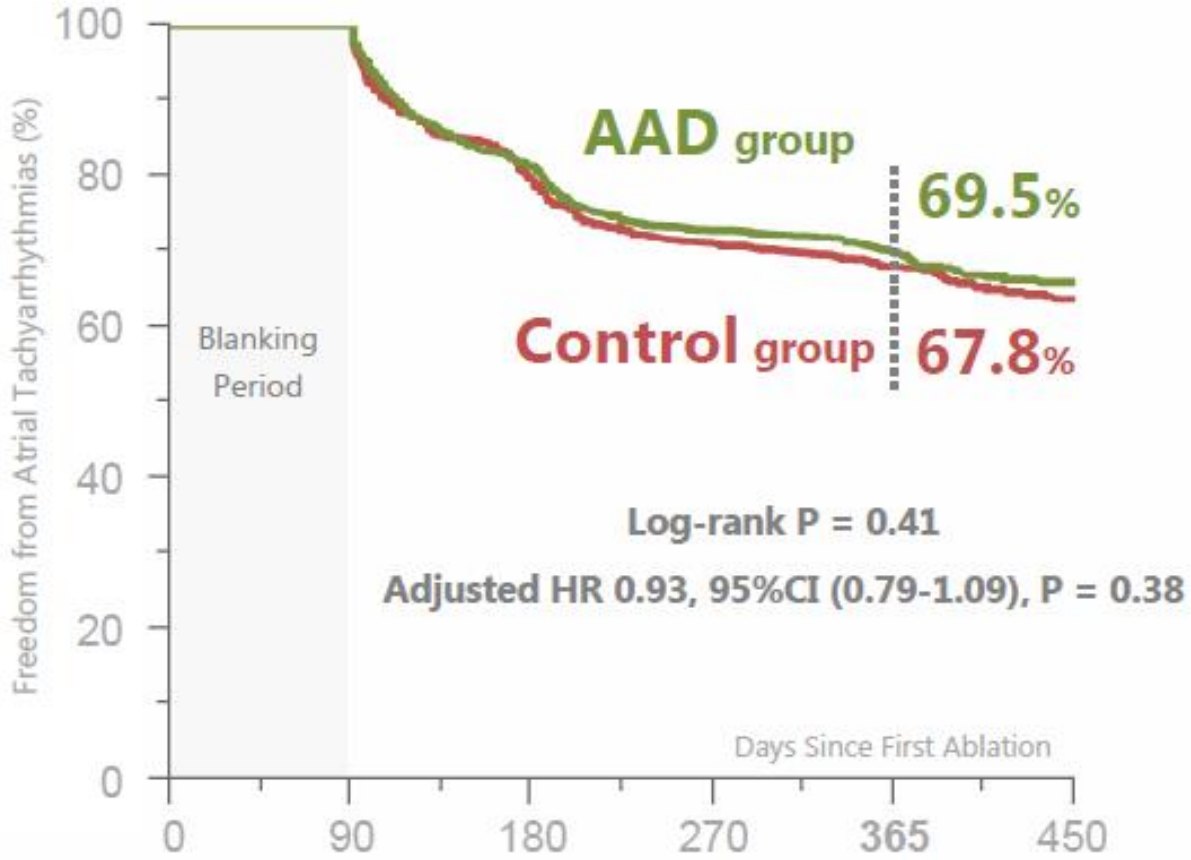
## Freedom from AF/AT during the blanking period




| Interval | 0d | 30d | 60d | 90d |
|---|---|---|---|---|
| AAD group; N at risk | 1016 | 640 | 623 | 600 |
| Control group; N at risk | 1022 | 569 | 549 | 532 |

# Primary endpoint

## Freedom from AF/AT at 12-months of follow-up

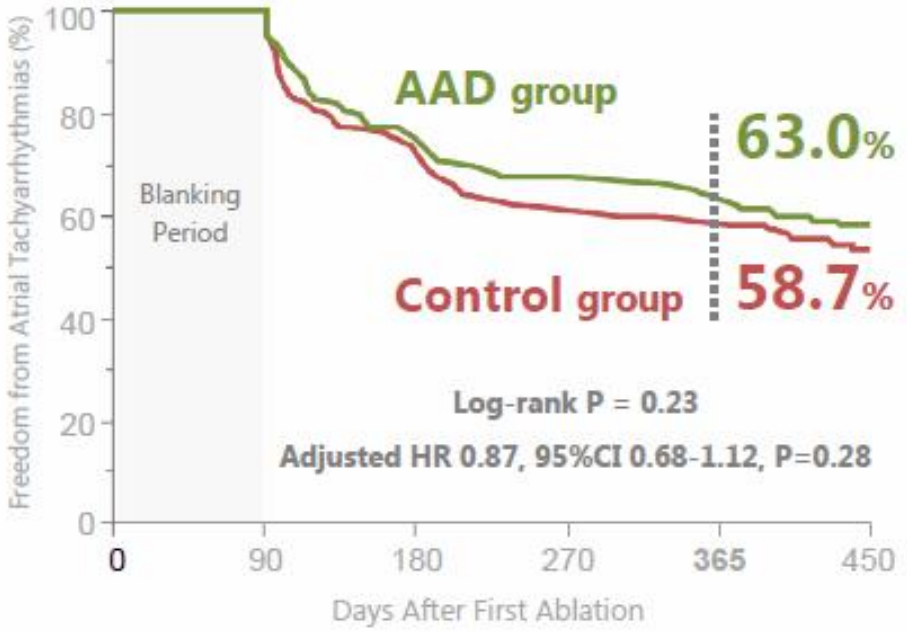



| Interval | 0d | 90d | 180d | 270d | 365d | 450d |
|---|---|---|---|---|---|---|
| AAD group; N at risk | 1016 | 1016 | 828 | 737 | 570 | 163 |
| Control group; N at risk | 1022 | 1021 | 810 | 723 | 557 | 165 |

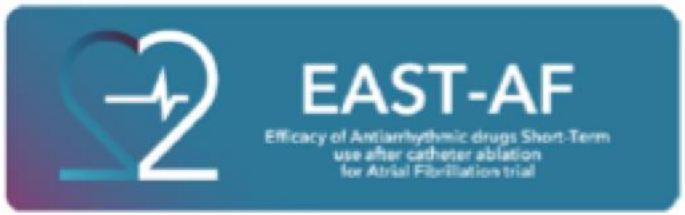
## Paroxysmal AF


| Interval | 0d | 180d | 365d |
|---|---|---|---|
| AAD group; N at risk | 692 | 582 | 402 |
| Control group; N at risk | 684 | 565 | 395 |

## Persistent / Long-Lasting AF




| Interval | 0d | 180d | 365d |
|---|---|---|---|
| AAD group; N at risk | 324 | 246 | 168 |
| Control group; N at risk | 338 | 245 | 162 |




- AF ablasyonu takiben 90 günlük periyodda kısa dönem AAİ kullanımı kullanım süresi içinde AT/AF rekürrensi anlamlı şekilde azaltmıştır

- Bununla beraber bu azalma 1 yıllık takipte klinik sonuçlarda iyileşmeye yol açmamıştır

# SARA Study

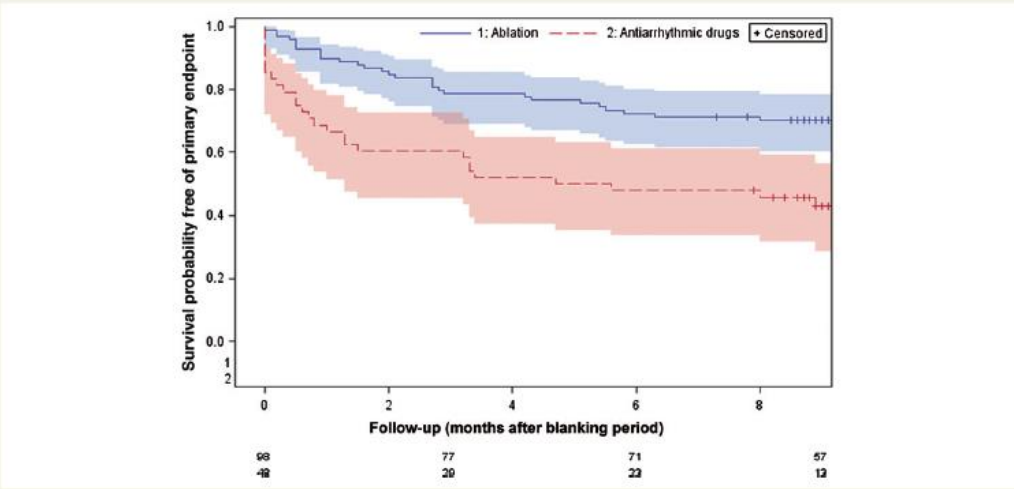



**Figure 2** Survival curves for the primary endpoint.

**Table 2** Secondary outcomes

| Outcome | Ablation ($n = 98$) | Drug therapy ($n = 48$) |
|---|---|---|
| Free of any recurrence of AF or flutter (confirmed during >30 s) | 59 (60.2) | 14 (29.2)[a,***] |
| Crossovers | 35 (35.7) | 0 (0)[a,***] |
| Cardioversions | | |
| None | 64 (65.3) | 24 (50.0)[b,*] |
| 1 | 22 (22.4) | 10 (20.8) |
| 2 or more | 12 (12.2) | 14 (29.2) |
| Hospitalizations related to arrhythmia | 2 (2.0) | 3 (6.25)[c] |

AF, atrial flutter.
[a]$\chi^2$ test.
[b]Cochrane–Armitage test.
[c]Fisher's exact test.
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

Persistan AF hastalarında 12 aylık takiplerde kateter ablasyon tedavisi; sinüs ritminin idamesinde antiaritmik ilaç tedavisine üstündür

Eur Heart J 2014;34:501-7

# **STAR AF II** (The Substrate and Trigger Ablation for Reduction of Atrial Fibrillation Trial Part II )

The NEW ENGLAND JOURNAL of MEDICINE

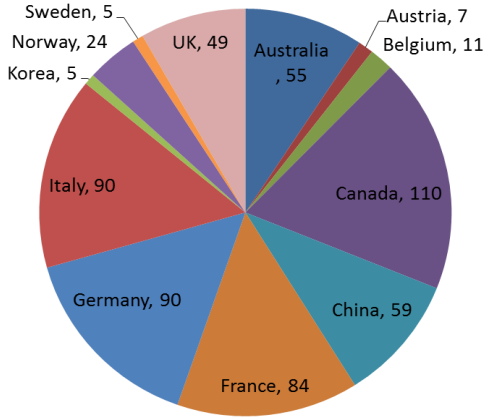
ORIGINAL ARTICLE

## Approaches to Catheter Ablation for Persistent Atrial Fibrillation

N Engl J Med. 2015 May 7;372(19):1812-22.

# Metod

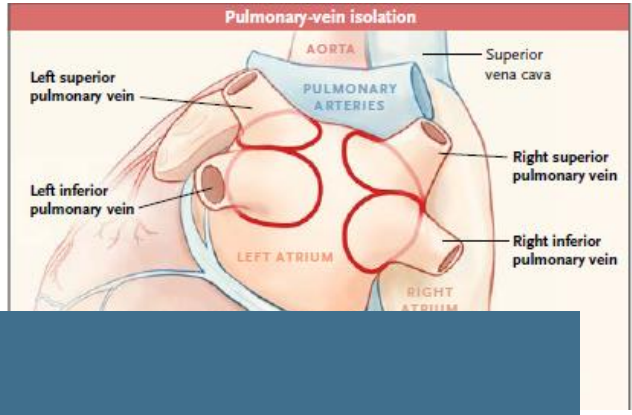
- 12 ülke 48 merkezden toplam 589 hasta
- **<u>Çalışmaya dahil edilme:</u>** En az bir antiaritmik ilaç tedavisine dirençli semptomatik persistan AF ( sustained epizod > 7 gün ve < 3 yıl)
- **<u>Çalışmadan dışlanma:</u>** Paroksismal AF, sustained AF epizodu > 3 yıl, sol atrium çapı > 60 mm



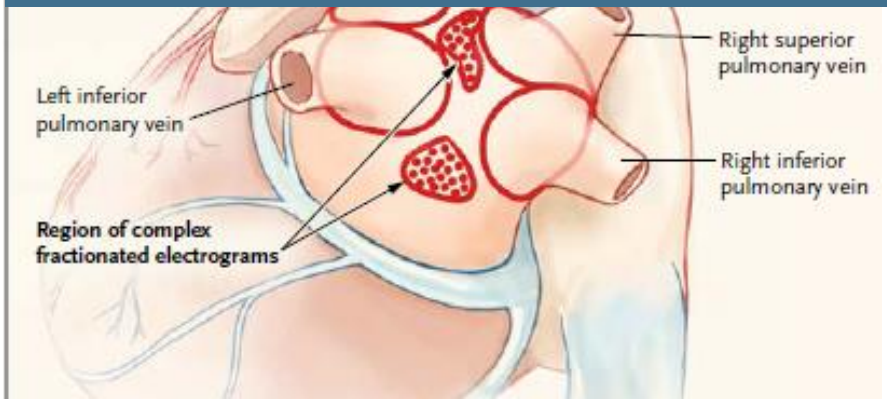
## Persistan AF'de:

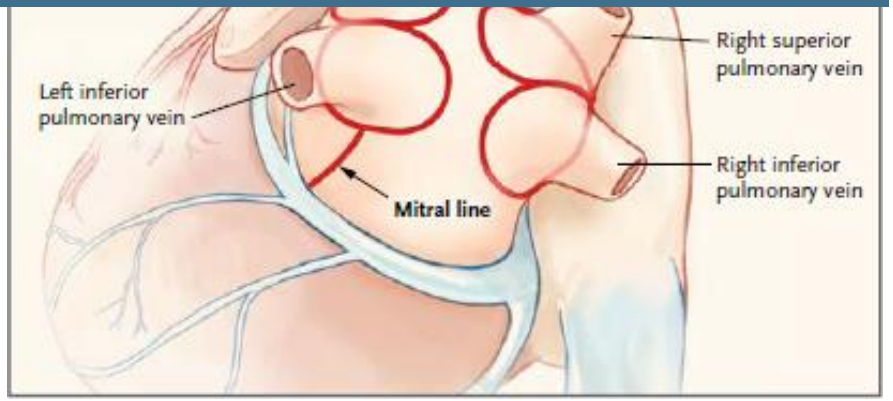
İzole pulmoner ven izolasyonu

Pulmoner ven izolasyonu + komplex fraksiyone elektrokardiyogram




- Hastalar 1:4:4 şeklinde üç stratejiye randomize
- İlk ablasyondan sonra aynı randomizasyon stratejisine 3-6 ay içinde tekrar ablasyon prosedürüne izin veriliyor



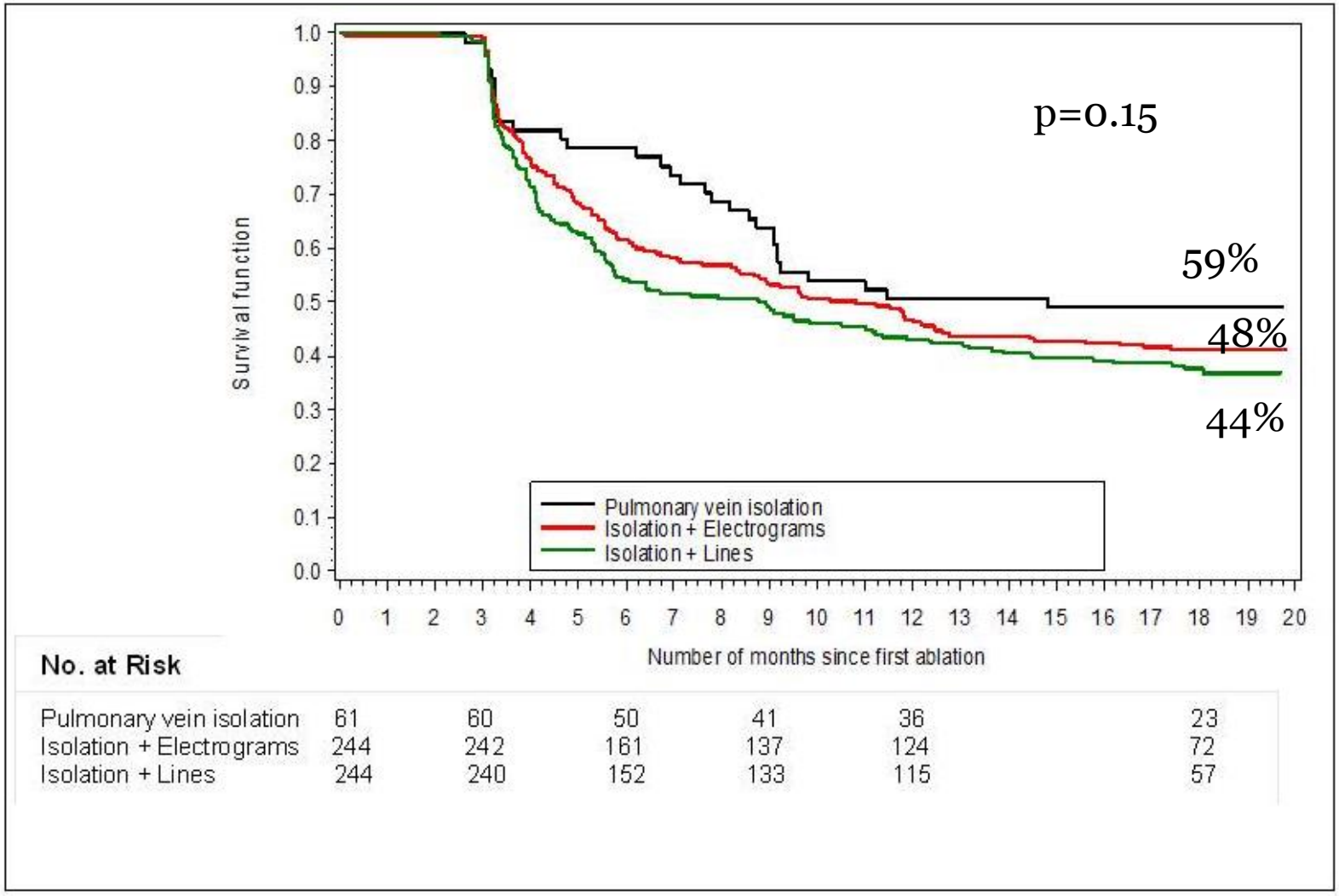



| | PVI | PVI+CFE | PVI+Lineer |
|---|---|---|---|
| Yaş-yıl | 58 ± 10 | 60 ± 9 | 61 ± 9 |
| Cinsiyet-erkek (n) (%) | 52 (78) | 213 (82) | 196 (76) |
| Ejeksiyon fraksiyonu (%) | 55 ± 11 | 57 ± 10 | 57 ± 10 |
| Sol atriyum (mm) | 44 ± 6 | 44 ± 6 | 46 ± 6 |
| İlk AF tanısından itibaren geçen süre (yıl) | 4.3 ± 6.3 | 4.2 ± 5.0 | 3.6 ± 4.2 |
| Bazal AF sıklığı (saat/ay) | 83 ± 36 | 85 ± 33 | 80 ± 37 |
| 6 aydan uzun sürekli AF– n (%) | 52 (78) | 207 (80) | 186 (72) |
| Medikal öykü– n (%) | | | |
| Hipertansiyon | 32 (48) | 143 (55) | 158 (62) |
| Diyabet | 6 (9) | 31 (12) | 26 (10) |
| Koroner arter hastalığı | 2 (3) | 21 (8) | 29 (11) |
| İnme/GİA | 6 (9) | 14 (5) | 19 (7) |
| Kalp yetersizliği | 3 (4) | 10 (4) | 15 (6) |
| $CHADS_2$ skoru - n (%) | | | |
| 0 | 31 (46) | 93 (36) | 81 (32) |
| 1 | 25 (37) | 126 (48) | 127 (50) |
| 2 | 6 (9) | 31 (12) | 29 (11) |
| >2 | 5 (7) | 10 (4) | 19 (7) |

# Sonuçlar

| | PVI | PVI+CFE | PVI+Lineer | P değeri |
|---|---|---|---|---|
| **Prosedür zamanı (dk)** | 166.95 ± 54.83 | 229.16 ± 83.20 | 222.56 ± 89.37 | <0.0001 |
| **Mapping zamanı (dk)** | 13.89 ± 6.64 | 18.75 ± 14.01 | 14.38 ± 7.68 | <0.0001 |
| **Floroskopi zamanı (dk)** | 29.35 ± 16.21 | 42.11 ± 21.70 | 40.91 ± 24.97 | 0.0003 |

# Herhangi bir prosedür sonrası, antiaritmik ilaç alıp almamaktan bağımsız >30 sn dokumante AF



| Kategori | PVI (n=64) | PVI+CFE (n=254) | PVI+Lineer (n=250) | Total (n=568) |
|---|---|---|---|---|
| Giriş yeri hematomu | 2 | 0 | 3 | 5 |
| /İnme | 0 | 2 | 1 | 3 |
| Atriyal-özefageal fistül/İşleme bağlı ölüm | 0 | 1 | 0 | 1 |

Pulmoner ven izolasyonuna diğer iki prosedürün eklenmesi, persistan AF hastalarında rekürren AF gelişimi açısından fark yaratmamakta

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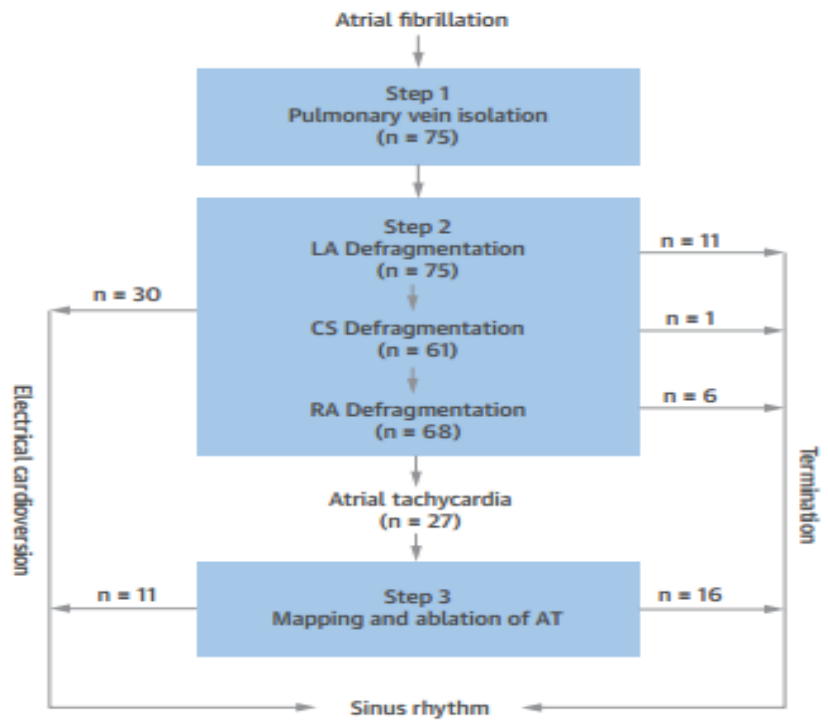
# Pulmonary Vein Isolation Versus Defragmentation

## 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, MD†

**FIGURE 1** Stepwise Ablation Approach




The subsequent ablation steps used with the stepwise approach. AT = atrial tachycardia; CS = coronary sinus; LA = left atrium; RA = right atrium.

**TABLE 1 Baseline Characteristics**

| | PVI (n = 78) | Full Defragmentation (n = 75) | p Value |
|---|---|---|---|
| Patient demographics | | | |
| Age, yrs | 63.0 ± 9.6 | 61.1 ± 10.9 | 0.43 |
| Male | 56 (71.8) | 60 (80.0) | 0.24 |
| Body mass index, kg/m$^2$ | 27.2 ± 4.7 | 27.5 ± 3.2 | 0.78 |
| Baseline dates concerning AF | | | |
| History of AF, months | 52.1 ± 47.7 | 64.4 ± 61.2 | 0.56 |
| Longest episode of AF, days | 324.0 ± 435.8<br>184.3 (121.7-365.2) | 167.0 ± 130.9<br>152.2 (64.93-235.9) | 0.03 |
| $CHA_2DS_2$-VASc score | 2.1 ± 1.3 | 1.7 ± 1.3 | 0.10 |
| Medical history | | | |
| Coronary artery disease | 21 (26.9) | 12 (16.0) | 0.10 |
| Valvular heart disease | 5 (6.4) | 2 (2.7) | 0.44 |
| Arterial hypertension | 65 (83.3) | 57 (76.0) | 0.26 |
| Dyslipidemia | 39 (50.0) | 26 (34.7) | 0.06 |
| Baseline echocardiographic measurements | | | |
| LVEF, % | 60.0 ± 7.1 | 59.8 ± 7.1 | 0.99 |
| LA diameter, mm | 44.5 ± 6.6 | 43.7 ± 5.2 | 0.30 |
| Antiarrhythmic therapy before ablation | 35 (46.1) | 35 (46.7) | 0.94 |
| Amiodarone | 20 (26.3) | 17 (22.7) | |
| Flecainide/propafenone | 9 (11.6)/1 (1.0) | 9 (12)/0 (0.0) | |
| Dronedarone | 4 (5.3) | 8 (10.7) | |

Values are mean ± SD, n (%), or median (interquartile range).

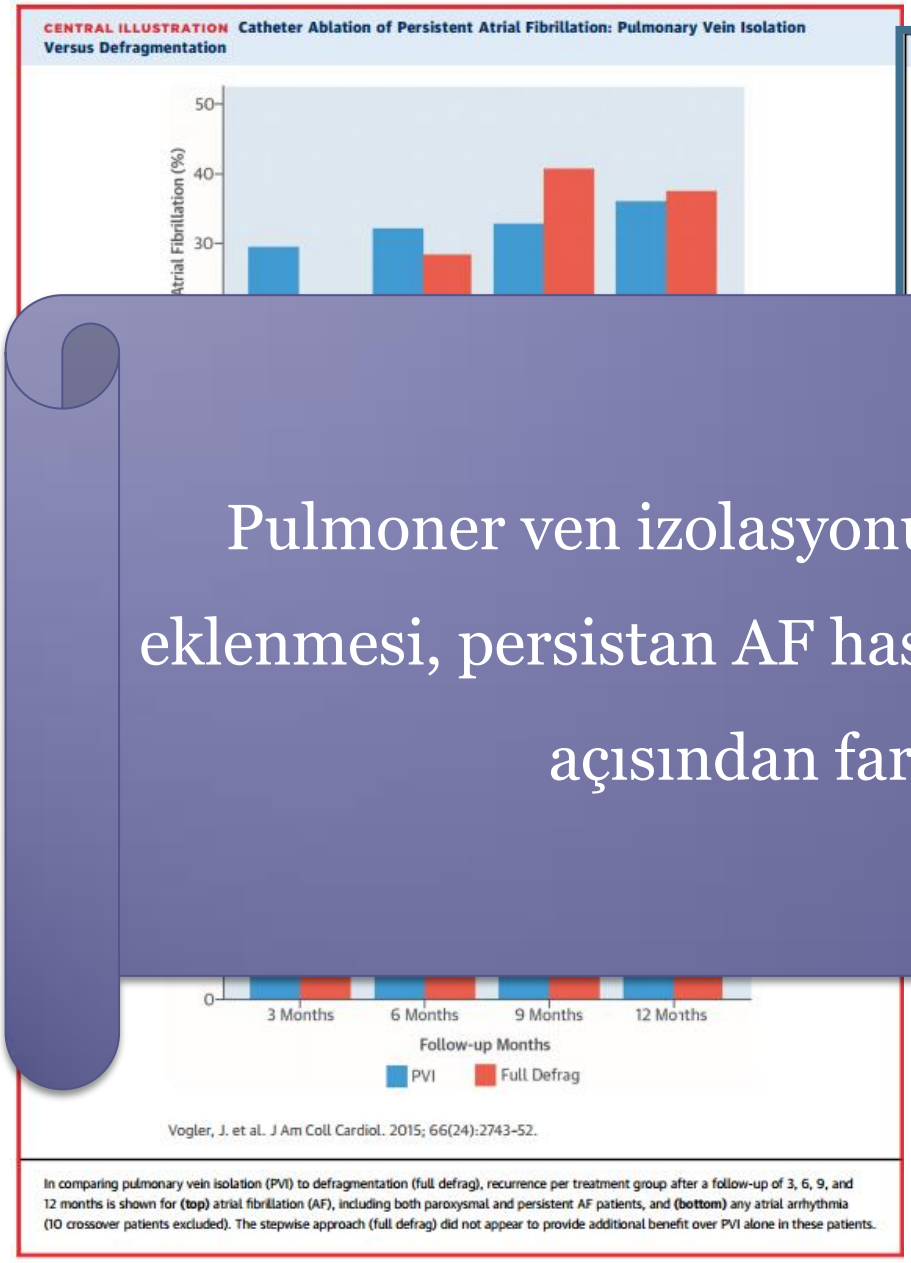
AF = atrial fibrillation; $CHA_2DS_2$-VASc = congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, prior stroke or TIA or thromboembolism, vascular disease, age 65-74 years, sex; LA = left atrium; LVEF = left ventricular ejection fraction; PVI = pulmonary vein isolation.

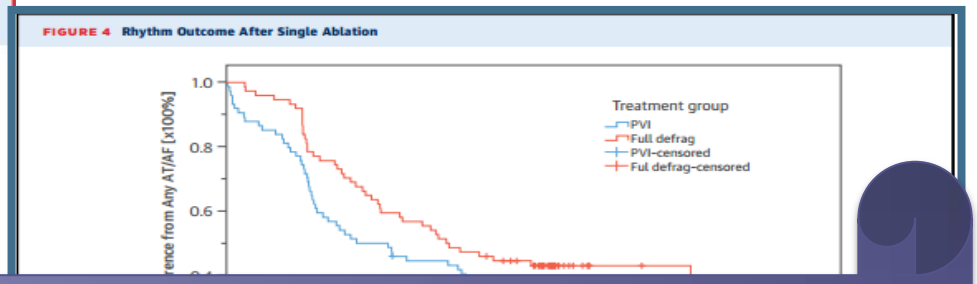
**TABLE 2 Procedural Data**

| Variable | PVI | Full Defragmentation | p Value |
|---|---|---|---|
| Baseline AFCL, ms | | | |
| LAA | 171.9 ± 28.8 | 168.4 ± 34.8 | 0.73 |
| RAA | 172.7 ± 31.3 | 173.0 ± 37.0 | 0.62 |
| CS | 180.9 ± 123.0 | 166.7 ± 32.8 | 0.38 |
| LSPV | 177.6 ± 32.4 | 175.0 ± 36.7 | 0.87 |
| LIPV | 176.6 ± 30.9 | 175.9 ± 28.8 | 0.93 |
| RSPV | 181.5 ± 34.3 | 188.4 ± 33.3 | 0.16 |
| RIPV | 182.3 ± 29.8 | 183.0 ± 26.9 | 0.65 |
| Procedure duration, min | 124.9 ± 36.5 | 220.6 ± 58.2 | <0.001 |
| Radiofrequency application time, min | 45.0 ± 22.5 | 99.9 ± 36.2 | <0.001 |
| Fluoroscopy time, min | 26.9 ± 12.3 | 52.7 ± 18.3 | <0.001 |
| Fluid intake, ml | 1,356.9 ± 600.5 | 2,821.1 ± 942.3 | <0.001 |

Values are mean ± SD.

AFCL = atrial fibrillation cycle length; CS = coronary sinus; LAA = left atrial appendage; LIPV = left inferior pulmonary vein; LSPV = left superior pulmonary vein; PVI = pulmonary vein isolation; RAA = right atrial appendage; RIPV = right inferior pulmonary vein; RSPV = right superior pulmonary vein.




Pulmoner ven izolasyonuna full defragmentasyonun eklenmesi, persistan AF hastalarında rekürren AF gelişimi açısından fark yaratmamakta

(p=0.468)

Original Article

# Radiofrequency Ablation of Persistent Atrial Fibrillation

## Diagnosis-to-Ablation Time, Markers of Pathways of Atrial Remodeling, and Outcomes

Ayman A. Hussein, MD; Walid I. Saliba, MD; Amr Barakat, MD; Mohammed Bassiouny, MD; Mohammed Chamsi-Pasha, MD; Rasha Al-Bawardy, MD; Ali Hakim, BS; Khaldoun Tarakji, MD; Bryan Baranowski, MD; Daniel Cantillon, MD; Thomas Dresing, MD; Patrick Tchou, MD; David O. Martin, MD; Niraj Varma, MD; Mandeep Bhargava, MD; Thomas Callahan, MD; Mark Niebauer, MD; Mohamed Kanj, MD; Mina Chung, MD; Andrea Natale, MD; Bruce D. Lindsay, MD; Oussama M. Wazni, MD

***Background*—**Various ablation strategies of persistent atrial fibrillation (PersAF) have had disappointing outcomes, despite concerted clinical and research efforts, which could reflect progressive atrial fibrillation–related atrial remodeling.

***Methods and Results*—**Two-year outcomes were assessed in 1241 consecutive patients undergoing first-time ablation of PersAF (2005–2012). The time intervals between the first diagnosis of PersAF and the ablation procedures were determined. Patients had echocardiograms and measures of B-type natriuretic peptide and C-reactive protein before the procedures. The median diagnosis-to-ablation time was 3 years (25th–75th percentiles 1–6.5). With longer diagnosis-to-ablation time (based on quartiles), there was a significant increase in recurrence rates in addition to an increase in B-type natriuretic peptide levels ($P$=0.01), C-reactive protein levels ($P$<0.0001), and left atrial size ($P$=0.03). The arrhythmia recurrence rates over 2 years were 33.6%, 52.6%, 57.1%, and 54.6% in the first, second, third, and fourth quartiles, respectively ($P_{categorical}$<0.0001). In Cox Proportional Hazard analyses, B-type natriuretic peptide levels, C-reactive protein levels, and left atrial size were associated with arrhythmia recurrence. The diagnosis-to-ablation time had the strongest association with the ablation outcomes which persisted in multivariable Cox analyzes (hazard ratio for recurrence per +1Log diagnosis-to-ablation time 1.27, 95% confidence interval 1.14–1.43; $P$<0.0001; hazard ratio fourth versus first quartile 2.44, 95% confidence interval 1.68–3.65; $P_{categorical}$<0.0001).

***Conclusions*—**In patients with PersAF undergoing ablation, the time interval between the first diagnosis of PersAF and the catheter ablation procedure had a strong association with the ablation outcomes, such as shorter diagnosis-to-ablation times were associated with better outcomes and in direct association with markers of atrial remodeling.
**(*Circ Arrhythm Electrophysiol*. 2016;9:e003669. DOI: 10.1161/CIRCEP.115.003669.)**

**Table 1. Baseline Characteristics of the Overall Study Population and Categorized Into Quintiles of the Time Interval Between the First Diagnosis of Persistent Atrial Fibrillation and the Ablation Procedure**

| | | First Diagnosis to Ablation Time Quartiles, y | | | | |
|---|---|---|---|---|---|---|
| Variable | All Patients | ≤1 | 1.1–3.0 | 3.1–6.5 | >6.5 | *P* Value |
| N | 1241 | 382 | 287 | 268 | 304 | |
| Continuous AF, weeks | 13 (6–34) | 12 (3–26) | 13 (3–30) | 11 (4–26) | 11 (5–57) | 0.0004 |
| Continuous AF>12 months | 17.3 | 5.2 | 19.6 | 19.9 | 28.2 | <0.0001 |
| Age, y | 61.0±10.2 | 60.9±10.4 | 60.9±9.7 | 60.7±10.2 | 61.4±10.3 | 0.9 |
| Male sex | 78.5 | 78.3 | 77.0 | 75.8 | 82.6 | 0.2 |
| Coronary disease | 20.1 | 18.6 | 19.9 | 23.5 | 19.4 | 0.4 |
| Hypertension | 38.5 | 31.7 | 33.8 | 45.9 | 45.1 | <0.0001 |
| Diabetes mellitus | 8.5 | 6.5 | 9.4 | 9.0 | 9.5 | 0.4 |
| LVEF, % | 52.3±9.4 | 52.4±9.1 | 52.1±9.5 | 52.3±9.3 | 52.3±9.8 | 0.9 |
| Left atrial size, $cm^2$ | 26.7±6.3 | 25.5±5.3 | 26.8±7.7 | 26.9±6.0 | 27.4±6.0 | 0.03 |
| hs-CRP, mg/L | 1.8 (0.9–4.1) | 1.5 (0.7–3.4) | 1.8 (0.8–4) | 2.3 (0.9–5.4) | 2.1 (1.1–4.1) | <0.0001 |
| BNP, pg/mL | 117 (66–191) | 104 (58–175) | 122 (67–207) | 116 (62–203) | 126 (80–189) | 0.01 |
| Ablation | | | | | | |
| PV isolation | 100 | 100 | 100 | 100 | 100 | 1 |
| Left atrial ablations | 65.6 | 68.4 | 68.6 | 63.6 | 64.2 | 0.6 |
| SVC isolation | 69.6 | 53.0 | 64.1 | 72.3 | 83.2 | <0.0001 |

Numbers are %, median (25th–75th percentile) or mean±SD. AF indicates atrial fibrillation; BNP, B-type natriuretic peptide; CRP, C-reactive protein; LVEF, left ventricular ejection fraction; PV, pulmonary vein; and SVC, superior vena cava.


Persistant AF'nin ilk tanısı ile kateter ablasyonu arasında geçen süre ile ablasyon başarısı arasında güçlü bir ilişki saptanmıştır.

**Table 2. Persistent Atrial Fibrillation (PersAF) Ablation Outcomes in Univariable and Multivariable Cox Proportional Hazards Analyses**

| | Univariable | | Multivariable |
|---|---|---|---|
| | Hazard Ratio (95% CI) | *P* Value | Hazard Ratio (95% CI) |
| 3 (3.1–6.5 y) | 1.95 (1.54–2.47) | | 2.32 (1.59–3.47) |
| 4 (>6.5 y) | 1.94 (1.54–2.44) | | 2.44 (1.68–3.65) |

The hazard ratios are for arrhythmia recurrence over 2 years of follow-up after a single ablation procedure and off antiarrhythmics. AF indicates atrial fibrillation; BNP, B-type natriuretic peptide; CI, confidence interval; CRP, C-reactive protein; LA, left atrium; LVEF, left ventricular ejection fraction; Time in PAF, time with paroxysmal; AF diagnosis before the diagnosis of persistent AF.

*Separate multivariable model because of overlap with the primary variable of interest.

# The long-term efficacy of cryoballoon vs irrigated radiofrequency ablation for the treatment of atrial fibrillation: A meta-analysis

Xiaocheng Cheng [a,*], Qiongwen Hu [b], Changyue Zhou [a], Lin qiong Liu [a], Tong Chen [a], Zengzhang Liu [c], Xuewen Tang [a,*]

Literatür taraması

3 randomize , 8 retrospektif çalışma

1261 hasta, ortalama takip süresi 16.5 ay

International Journal of Cardiology 181 (2015) 297-302

X. Cheng et al. / International Journal of Cardiology 181 (2015) 297–302

| Study or Subgroup | CRYO Events | CRYO Total | RF Events | RF Total | Weight | Risk Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Linhart 2009 | 11 | 20 | 9 | 20 | 1.1% | 1.22 [0.65, 2.29] |
| Kojodjojo 2010 | 69 | 90 | 38 | 53 | 9.7% | 1.07 [0.87, 1.31] |
| Kühne 2010 | 22 | 25 | 23 | 25 | 11.6% | 0.96 [0.79, 1.15] |
| Sorgente 2010 | 23 | 30 | 19 | 29 | 3.9% | 1.17 [0.84, 1.63] |
| Herrera 2012 | 19 | 30 | 24 | 30 | 4.0% | 0.79 [0.57, 1.10] |
| Maagh 2013 | 22 | 30 | 30 | 42 | 5.0% | 1.03 [0.77, 1.37] |
| Pokushalov 2013 | 17 | 40 | 23 | 40 | 2.1% | 0.74 [0.47, 1.16] |
| Mandell 2013 | 59 | 62 | 58 | 62 | 42.5% | 1.02 [0.93, 1.11] |
| Mugnai 2014 | 86 | 136 | 147 | 260 | 14.1% | 1.12 [0.95, 1.32] |
| Pérez-Castellano 2014 | 12 | 25 | 17 | 25 | 1.8% | 0.71 [0.43, 1.15] |
| Knecht 2014 | 34 | 71 | 40 | 71 | 4.2% | 0.85 [0.62, 1.17] |
| **Total (95% CI)** | | **559** | | **657** | **100.0%** | **1.01 [0.94, 1.07]** |
| Total events | 374 | | 428 | | | |

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 10.54$, df = 10 (P = 0.39); $I^2 = 5\%$

Test for overall effect: Z = 0.16 (P = 0.87)

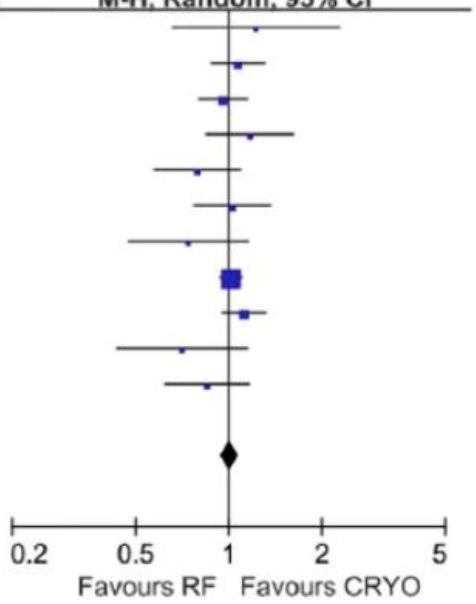



**Fig. 2.** Forest plot for the proportion of patients free from AF.

# CBA uzun dönem takipte RFA kadar başarılı

Heart, Lung and Circulation (2015) xx, 1–6
1443-9506/04/$36.00
http://dx.doi.org/10.1016/j.hlc.2015.07.012

ORIGINAL ARTICLE

# Long Term Follow-up of Pulmonary Vein Isolation using Cryoballoon Ablation

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[b]Toronto General Hospital, Toronto, Ontario, Canada

*Received 7 April 2015; received in revised form 26 May 2015; accepted 19 July 2015; online published-ahead-of-print xxx*

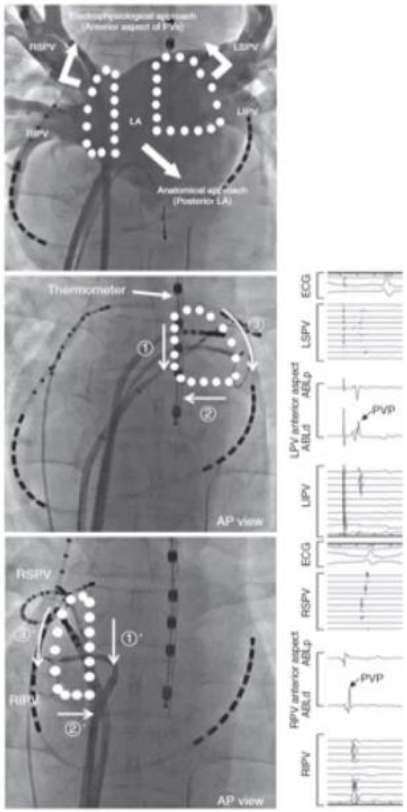
**Background** Cryoballoon ablation is an established catheter-based approach to treating atrial fibrillation (AF). There is little data regarding the long-term efficacy of this approach.

**Methods** We enrolled 200 consecutive patients with symptomatic AF who had failed therapy with at least one anti-arrhythmic medication and followed them for five years. The primary efficacy endpoint was symptomatic recurrence of AF after a single cryoballoon ablation procedure.

**Results** Two hundred patients formed the study group. Median follow-up was 56 months. Following a single procedure, 46.7% of patients with paroxysmal AF remained free of symptomatic recurrence of AF compared to 35.6% of patients with persistent AF. When allowing for repeat ablations, at the end of the follow-up period 53.3% of patients in the paroxysmal group remained free of symptomatic AF compared to 47.5% in the persistent group. The rate of complications was low.

**Conclusions** Cryoballoon ablation is an effective catheter-based approach for treating symptomatic AF with a low risk of complications.

# Simultaneous isolation of superior and inferior pulmonary veins on both the left and right sides could yield better outcomes in patients with paroxysmal atrial fibrillation

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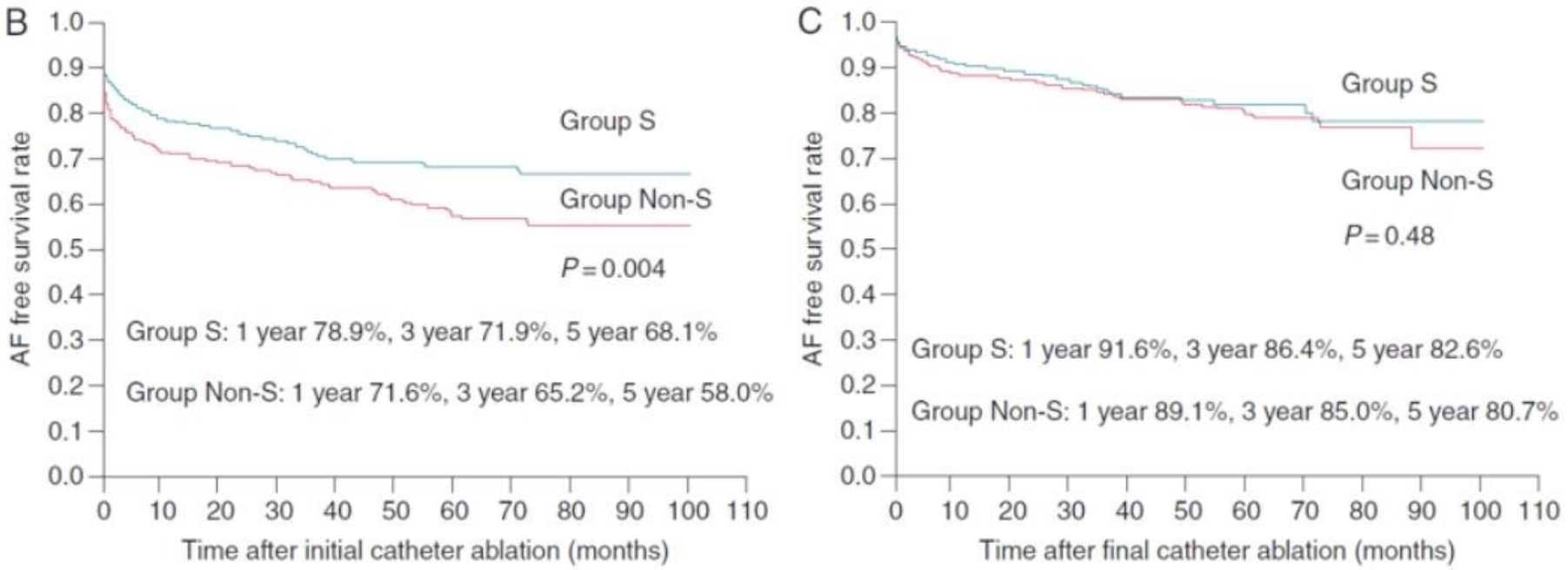


Başlangıç başarısı daha iyi, final başarıda fark yok

# **Durability of Pulmonary Vein Isolation with Cryoballoon Ablation:** Results from the Sustained PV Isolation with Arctic Front Advance (SUPIR) Study

VIVEK Y. REDDY, M.D.,* LUCIE SEDIVA, M.D.,† JAN PETRU, M.D., PH.D.,† JAN SKODA, M.D.,† MILAN CHOVANEC, M.D.,† ZITA CHITOVOVA, M.D.,† PAOLA DI STEFANO, PH.D.,‡ ETHEL RUBIN, PH.D.,§ SRINIVAS DUKKIPATI, M.D.,* and PETR NEUZIL, M.D., PH.D.†

From the *Cardiac Arrhythmia Service of the Mt. Sinai Hospital, New York, New York, USA; †Homolka Hospital, Prague, Czech Republic; ‡EMEA Regional Clinical Center, Medtronic Clinical Research Institute, Milan, Italy; and §Medtronic Inc., Minneapolis, Minnesota, USA

**Durability of Pulmonary Vein Isolation with Cryoballoon Ablation.** ***Introduction:*** **Pulmonary vein (PV) reconnection remains the most important cause of AF recurrence after AF ablation. The second-generation cryoballoon catheter's ability to achieve durable PV isolation was assessed in a prospective nonrandomized clinical trial.**

***Methods and Results:*** **PV isolation was performed by 4-minute ablations. Following verification of electrical isolation by a multielectrode mapping catheter, 1 additional lesion per PV was applied. Esophageal temperatures were monitored and all patients underwent postprocedure esophageal endoscopy. All patients underwent a second PV remapping procedure at ~3 months to assess for PVI durability. Eighty-four (100%) veins were acutely isolated using only the 28 mm cryoballoon in 21 consecutive PAF patients with 2.2 ± 0.6 cryoapplications per vein, with the majority (83%) occurring after a single freeze. One patient presented with hematemesis and an esophageal ulceration that was treated conservatively; there were no episodes of esophageal fistula or phrenic nerve palsy. At 3.4 (2.9–4.1) months postablation, 68/75 veins (91%) remained electrically isolated; all PVs remained durably isolated in 79% of patients. Two patients accounted for 5 of 7 reconducting veins. The most common site for reconnection was the inferior aspect of the RIPV (3/7 reconnections). Reconnected veins had poorer occlusion at the index ablation procedure than veins that maintained chronic isolation (occlusion grade 2.9 ± 0.7 vs. 3.4 ± 0.7, P = 0.001). Clinical AF recurrence was detected in 2 patients (11%) at follow-up.**

***Conclusions:*** **The improved thermodynamic characteristics of the second-generation cryoballoon led to a high rate of both single-shot PVI and chronic lesion durability. This high rate of durable PV isolation is anticipated to translate to improved clinical outcome.** *(J Cardiovasc Electrophysiol, Vol. 26, pp. 493-500, May 2015)*

Europace Advance Access published April 12, 2015

Europace
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CLINICAL RESEARCH

# One-year clinical success of a 'no-bonus' freeze protocol using the second-generation 28 mm cryoballoon for pulmonary vein isolation

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*Received 16 September 2014; accepted after revision 25 January 2015*

**Aims** Studies on the use of the second-generation 28 mm cryoballoon (CB) for the treatment of atrial fibrillation (AF) have reported superior 1-year clinical outcome. Customarily, a bonus freeze cycle is applied after pulmonary vein isolation (PVI). The purpose of the present study was to assess the 1-year clinical outcome following PVI foregoing a bonus freeze cycle.

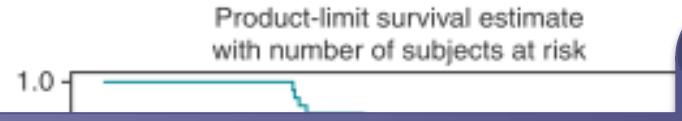
**Methods and results** Patients with drug-refractory paroxysmal AF (PAF) or persistent AF underwent PVI using the second-generation 28 mm CB. The freeze cycle duration was set at 240 s. No bonus freeze cycle was applied. Clinical follow-up (FU) included 12-lead ECGs and 24h-Holter ECGs at 3, 6, and 12 months. A total of 45 patients (age 60 ± 11 years, mean LA diameter 42.1 ± 8.6 mm, $n = 38$ [84%] PAF) underwent CB-based PVI. Of 177 pulmonary veins (PVs) identified, 176/177 (99%) PVs were successfully isolated. The mean number of CB applications was 1.2 ± 0.4, 1.5 ± 0.8, 1.4 ± 0.7, 1.1 ± 0.3 and 1.7 ± 1.2 for the right superior PVs, right inferior PVs, left superior PVs, left inferior PVs, and left common PVs, respectively. Mean procedure and fluoroscopy times were 113 ± 32 and 19 ± 7 min, respectively. Phrenic nerve palsy occurred in 1/45 (2%) patients. One of 45 (2%) patients was lost to FU. After a mean FU period of 392 ± 58 (267–522) days including a 3-month blanking period, 36 of 44 (82%) patients remained in stable sinus rhythm. Five out of eight patients with arrhythmia recurrence underwent a second procedure. Only those PVs isolated with a single freeze cycle (5/11 PVs, 45%) demonstrated PV reconduction. In contrast, no PV reconnection was found in PVs initially treated with multiple freeze cycles.

**Conclusions** A 'no-bonus'-freeze protocol for PVI using the second-generation 28 mm CB resulted in an 82% 1-year clinical success rate. A bonus freeze cycle following successful PVI may not be essential to superior clinical outcome.

**Keywords** Atrial fibrillation • Ablation • Pulmonary vein isolation • Cryoballoon • Outcome

**Table I Patients' baseline characteristics**

F, atrial fibrillation; LA, left atrial.




including a 3-month blanking period. SR, sinus rhythm.

İlaç tedavisine dirençli PAF ve persistant AF'li hastalarda 2. jenerasyon CB ile bir kez 240 sn dondurma ile bir yıllık sinüs ritmi oranı %82 saptanmıştır.

J Interv Card Electrophysiol
DOI 10.1007/s10840-015-0084-3

# Outcome of paroxysmal atrial fibrillation ablation with the cryoballoon using two different application times: the 4- versus 3-min protocol

Florian Straube[1] · Uwe Dorwarth[1] · Stefan Hartl[1] · Benedikt Bunz[1] · Michael Wankerl[1] · Ullrich Ebersberger[1] · Ellen Hoffmann[1]

Received: 1 September 2015 / Accepted: 30 November 2015


**Table 1** Baseline characteristics

| | Group 1 "240 s" $n=57$ | Group 2 "180 s" $n=57$ | $p$ value |
|---|---|---|---|
| Age, mean, SD | 65 ± 9 | 63 ± 11 | 0.573 |
| Female sex | 21 (37) | 22 (39) | 1.0 |
| Paroxysmal AF | 57 (100) | 57 (100) | 1.0 |
| AAD at baseline | 26 (46) | 29 (51) | 0.71 |
| Hypertension | 39 (68) | 32 (56) | 0.246 |
| Coronary heart disease | 2 (3.5) | 3 (5) | 1.0 |
| Structural heart disease | 13 (23) | 5 (9) | 0.070 |
| LVEF (%) | 57 ± 5 | 58 ± 4 | 0.595 |
| LA diameter (mm) | 41 ± 6 | 41 ± 6 | 0.79 |
| LA volume (ml) | 119 ± 32 | 106 ± 27 | 0.076 |
| Left common ostium[a] | 3 (5) | 6 (11) | 0.297 |
| Right middle vein[a] | 11 (19) | 12 (21) | 0.815 |

| | Group 1, 57 pts. $n=240$ veins | Group 2, 57 pts. $n=234$ veins | $p$ value |
|---|---|---|---|
| Time per cryoapplication (s), mean, SD | 221 ± 48 | 168 ± 33 | 0.0001 |
| Total ablation time (min.), mean SD | 43.1 ± 9.4 | 34.2 ± 6.7 | 0.0001 |
| Number of applications per patient, mean, SD | 11.7 ± 2.5 | 12.2 ± 2.7 | 0.344 |
| PV isolation with CB only | 240/240 (100 %) | 234/234 (100 %) | 1.0 |
| Intraprocedural PV reconduction | 1/240 (0.4 %) | 1/234 (0.4 %) | 1.0 |
| 23 mm CB only | 25/57 (44 %) | 20/57 (35 %) | 0.338 |
| 28 mm CB only | 18/57 (32 %) | 22/57 (39 %) | 0.432 |
| 23 and 28 mm CB | 14/57 (25 %) | 15/57 (28 %) | 0.830 |
| Procedure time (min.), mean, SD | 169 ± 52 | 141 ± 30 | 0.0001 |
| LA time (min.), mean, SD | 121 ± 46 | 100 ± 29 | 0.005 |
| Fluoroscopy time (min.), mean, SD | 28 ± 10 | 24 ± 9 | 0.017 |
| Dose-area product (cGyxcm$^2$), mean, SD | 3752 ± 3309 | 3318 ± 2228 | 0.520 |
| Usage of a spiral mapping catheter for positioning of the balloon (%) | 240/240 (100 %) | 230/234 (98, 3 %) | 0.042 |
| Feasibility of real-time recording | 112/240 (47 %) | 95/234 (41 %) | 0.183 |
| Time-to-isolation (s), EMM, SE | 38.8, 3.1 | 42.0, 2.9 | 0.434 |
| min. balloon temperature (°C), EMM, SE | −56.0, 0.8 | −53.5, 0.6 | 0.009 |

*EMM* estimated marginal mean, *LA* time left atrial dwell time, *PV* pulmonary vein, *SE* standard error

| | Group 1, 57 pts. $n = 240$ veins | Group 2, 57 pts. $n = 234$ veins | $p$ value |
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| Time per cryoapplication (s), mean, SD | 221 ± 48 | 168 ± 33 | 0.0001 |
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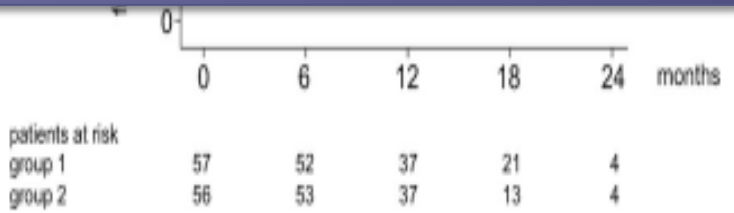
Paroksismal AF nedeniyle 180sn veya 240 sn çift dondurma yöntemiyle cryobalon ablasyon uygulanan hastalarda fark saptanmamıştır.



Europace
doi:10.1093/europace/euv365

CLINICAL RESEARCH

# One-year follow-up after second-generation cryoballoon ablation for atrial fibrillation in a large cohort of patients: a single-centre experience

**Ghazala Irfan[1†], Carlo de Asmundis[1†], Giacomo Mugnai[1], Jan Poelaert[2], Christian Verborgh[2], Vincent Umbrain[2], Stefan Beckers[2], Ebru Hacioglu[1], Burak Hunuk[1], Vedran Velagic[1], Erwin Stroker[1], Pedro Brugada[1], and Gian-Battista Chierchia[1*]**

[1]Heart Rhythm Management Centre, Universitair Ziekenhuis Brussel-Vrije Universiteit Brussel, Brussels 1090, Belgium; and [2]Department of Anesthesiology, Universitair Ziekenhuis Brussel-Vrije Universiteit Brussel, Brussels, Belgium

*Received 7 July 2015; accepted after revision 25 September 2015*

**Aim** The second-generation cryoballoon (CB-Adv) is effective in achieving pulmonary vein isolation (PVI) with encouraging results. In this study, we assessed the single-procedure outcome on a 1-year follow-up period in a large sample of patients having undergone PVI for drug-resistant atrial fibrillation (AF) using the CB-Adv.

**Methods and Results** A total of 393 patients (122 female, 31%; mean age 57.7 ± 12.9 years) with drug-refractory AF undergoing PVI using the novel CB-Adv 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. A total of 1572 pulmonary veins (PVs) were identified and successfully isolated with 1.2 ± 0.3 mean freezes. Mean procedure and fluoroscopy times were 87.1 ± 38.2 and 14.9 ± 6.1 min, respectively. At a mean follow-up of 12 months, freedom from ATas after a single procedure was achieved in 85.8% of patients with paroxysmal atrial fibrillation and in 61.3% of patients with persistent AF (persAF). Similar success rates were observed between bonus freeze and single freeze strategies, 82.5 and 81.8%, respectively ($P = 0.9$). Multivariate analysis demonstrated that persAF ($P = 0.04$) and relapses during blanking period (BP) ($P < 0.0001$) were independent predictors of ATas recurrences.

**Conclusion** Freedom from any ATa can be achieved in 81.9% of patients after a single CB-Adv procedure in a large cohort of patients. A bonus freeze does not influence the clinical outcome, and reducing the duration of the cryoapplication to 3 min offers excellent results. Persistent AF and arrhythmia recurrence during the BP are strong predictors of AF recurrence.

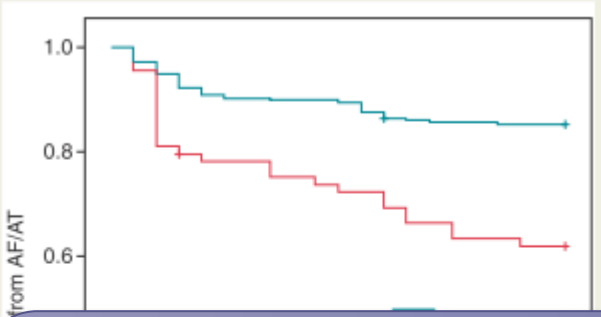



**Table 5** Univariate and multivariate Cox regression analyses for AF recurrences

| Variable | Beta coefficient | HR for AF recurrence | *P*-value |
|---|---|---|---|
| Univariate analysis | | | |
| Age (years) | 0.001 | 1.00 (0.98–1.02 95% CI) | |
| BMI (kg/m$^2$) | 0.06 | 1.06 (1.01–1.12 95% CI) | |

Ablasyon sonrası 12 aylık takipte PAF hastalarında %85.8, persistant AF'lihastalarda %61.3 başarı sağlanmıştır. 240 sn iki kez dondurma ile 180 sn bir kez dondurma arasında klinik sonlanımlar açısından fark saptanmamıştır.

Clin Res Cardiol (2016) 105:72–78
DOI 10.1007/s00392-015-0890-8

ORIGINAL PAPER

# Two-year outcome after pulmonary vein isolation using the second-generation 28-mm cryoballoon: lessons from the bonus freeze protocol

**Andreas Metzner[1] · Christian-Hendrik Heeger[1] · Peter Wohlmuth[1] · Bruno Reißmann[1] · Andreas Rillig[1] · Roland Richard Tilz[1] · Shibu Mathew[1] · Christine Lemes[1] · Sebastian Deiß[1] · Tilman Maurer[1] · Ardan Saguner[1] · Feifan Ouyang[1] · Karl-Heinz Kuck[1] · Erik Wißner[1]**

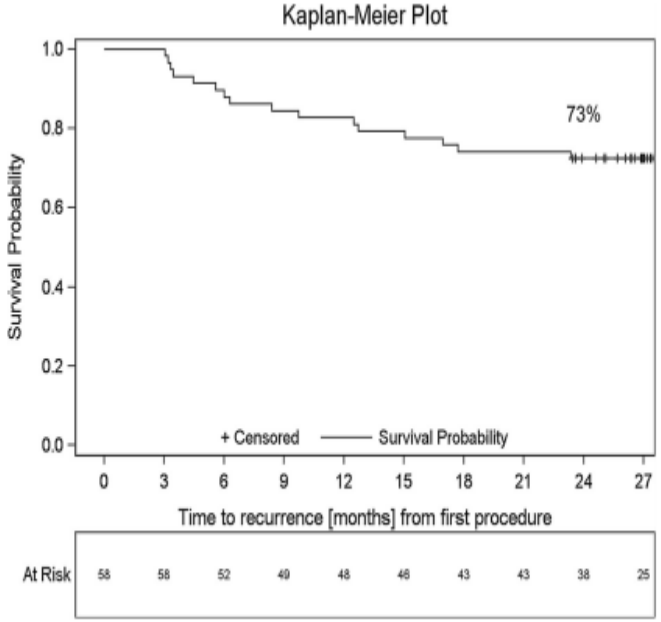
**Table 1** Baseline characteristics

| | |
|---|---|
| Patients, *n* | 60 |
| Age (years) | 62 ± 11 |
| Male gender, *n* (%) | 36 (60) |
| LA size (mm) | 43 ± 5 |
| Paroxysmal AF, *n* (%) | 45 (75) |
| Short-term persistent AF, *n* (%) | 15 (25) |
| Duration of AF (months) | 38 ± 31 |
| Left ventricular ejection fraction (%) | 64 ± 4 |
| Hypertension, *n* (%) | 42 (70 %) |
| Coronary artery disease, *n* (%) | 6 (10 %) |
| Diabetes mellitus, *n* (%) | 8 (13) |
| Mean $CHA_2DS_2$-VASc score | 2.0 ± 1.4 |

Values are mean ± SD or *n* (%) as appropriate

*LA* left atrium, *AF* atrial fibrillation

**Fig. 1** Kaplan–Meier curve. Kaplan–Meier curve demonstrating the relative proportion of patients in stable sinus rhythm following initial pulmonary vein isolation using the 28-mm second-generation cryoballoon during a mean follow-up period of 838 ± 67 days including a 3-month blanking period



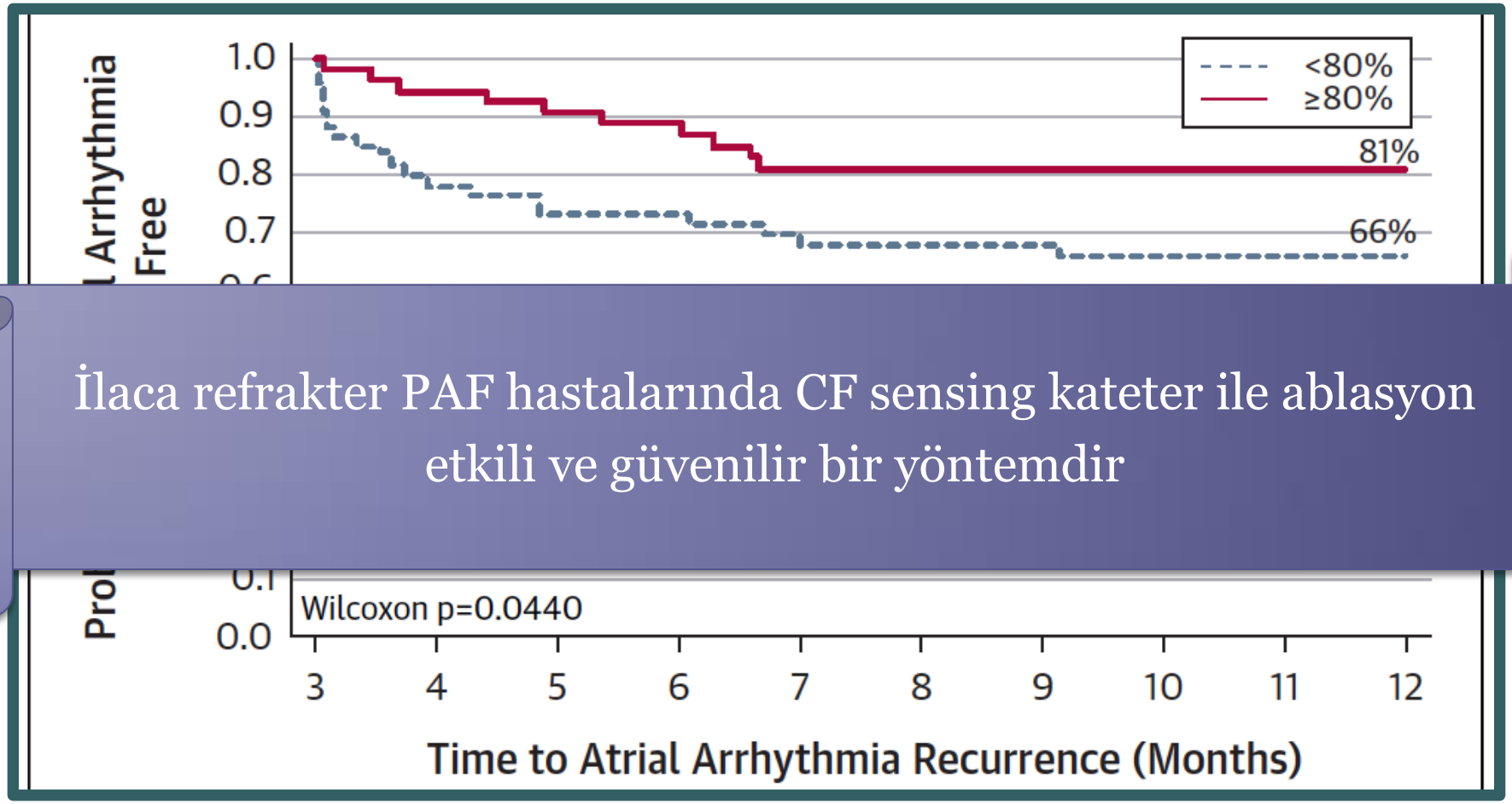
# Paroxysmal AF Catheter Ablation With a Contact Force Sensing Catheter

## Results of the Prospective, Multicenter SMART-AF Trial

Andrea Natale, MD,*†‡§‖¶ Vivek Y. Reddy, MD,# George Monir, MD,** David J. Wilber, MD,†† Bruce D. Lindsay, MD,‡‡ H. Thomas McElderry, MD,§§ Charan Kantipudi, MD,‖‖ Moussa C. Mansour, MD,¶¶ Daniel P. Melby, MD,## Douglas L. Packer, MD,*** Hiroshi Nakagawa, MD,††† Baohui Zhang, MS, SM,‡‡‡ Robert B. Stagg, PhD,‡‡‡ Lee Ming Boo, PharmD,‡‡‡ Francis E. Marchlinski, MD§§§

- 160 hasta, ≥1 antiaritmik ilaca refrakter PAF
- Contact force-sensing kateter ile ablasyon
- 4 tamponad, 3 perikardit, 1 AV blok, 4 vasküler giriş yeri komplikasyonu
- %72,5 hastada 12 aylık takipte (Afib/Aflutter/AT) nüks yok

J Am Coll Cardiol 2014;64:647–56




İlaca refrakter PAF hastalarında CF sensing kateter ile ablasyon etkili ve güvenilir bir yöntemdir

J Am Coll Cardiol 2014;64:647–56

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association.

# A Randomized Controlled Trial of the Safety and Effectiveness of a Contact Force Sensing Irrigated Catheter for Ablation of Paroxysmal Atrial Fibrillation: Results of the TOCCASTAR Study

Vivek Y. Reddy, Srinivas R. Dukkipati, Petr Neuzil, Andrea Natale, Jean-Paul Albenque, Josef Kautzner, Dipen Shah, Gregory Michaud, Marcus Wharton, David Harari, Srijoy Mahapatra, Hendrik Lambert and Moussa Mansour

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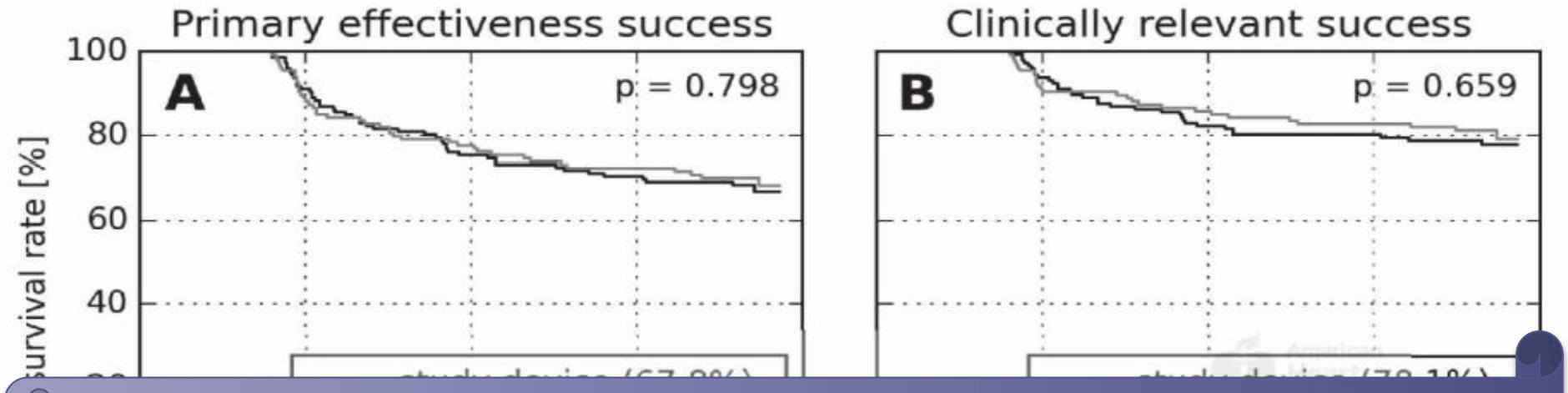
**Table 1.** Demographics of all patients in the safety population.

| | CF Catheter n = 152 | Control n = 143 | Total n = 295 | p value |
|---|---|---|---|---|
| Age (years) | 59.6±9.3 | 61.0±10.8 | 60.3±10.1 | 0.171 |
| Gender (male) | 100 (65.8%) | 91 (63.6%) | 191 (64.7%) | 0.716 |
| Coronary artery disease | 10 (6.6%) | 16 (11.2%) | 26 (8.8%) | 0.217 |
| Heart failure | 3 (2.0%) | 3 (2.1%) | 6 (2.0%) | 1 |
| Hypertension | 75 (49.3%) | 69 (48.3%) | 144 (48.8%) | 0.907 |
| Diabetes | 16 (10.5%) | 17 (11.9%) | 33 (11.2%) | 0.717 |
| Stroke or TIA | 5 (3.3%) | 12 (8.4%) | 17 (5.8%) | 0.080 |
| Structural heart disease | 6 (3.9%) | 6 (4.2%) | 12 (4.1%) | 1 |
| AADs at baseline | 132 (86.8%) | 125 (87.4%) | 257 (87.1%) | 1 |
| Left atrial diameter (mm) | [n = 135] 39.9±5.9 | [n = 125] 39.3±4.5 | [n = 260] 39.6±5.2 | 0.176 |
| LVEF (%) | [n = 136] 62.4±7.1 | [n = 127] 62.4±6.2 | [n = 263] 62.4±6.7 | 0.903 |

AAD = anti-arrhythmic drug, LVEF = left ventricular ejection fraction, TIA = transient ischemic attack. Values are mean ± standard deviation or n (%).




PAF hastalarında CF sensing irigasyonlu kateter ile ablasyonun etkili ve güvenilir bir yöntem olduğu gösterilmiştir

| | | |
|---|---|---|
| Device-related SAEs (primary) | 3 (1.97%) | 2 (1.40%) |
| Cardiac tamponade / perforation | 1 (0.66%) | 1 (0.70%) |
| Pericarditis | 2 (1.32%) | 0 (0.0%) |
| Pulmonary vein stenosis | 0 (0.0%) | 1 (0.70%) |
| Procedure-related SAEs | 10 (6.58%) | 11 (7.69%) |
| Cardiac tamponade / perforation | 1 (0.66%) | 1 (0.70%) |
| Pulmonary edema | 2 (1.32%) | 2 (1.40%) |
| Vascular access complications | 3 (1.97%) | 3 (2.10%) |
| Hospitalizations (initial or prolonged) | 4 (2.63%) | 5 (3.50%) |
| Total of device- or procedure-related SAEs | 11 (7.24%)* | 13 (9.09%) |

*2 patients in the CF group had device- and procedure-related events

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CLINICAL RESEARCH
*Ablation for atrial fibrillation*

# Comparison between radiofrequency with contact force-sensing and second-generation cryoballoon for paroxysmal atrial fibrillation catheter ablation: a multicentre European evaluation

**Fabien Squara[1,2*], Alexandre Zhao[2], Eloi Marijon[3,4], Decebal Gabriel Latcu[5], Rui Providencia[3], Giacomo Di Giovanni[6], Gaël Jauvert[2], Francois Jourda[3], Gian-Battista Chierchia[6], Carlo De Asmundis[6], Giuseppe Ciconte[6], Christine Alonso[2], Caroline Grimard[2], Serge Boveda[3], Bruno Cauchemez[2], Nadir Saoudi[5], Pedro Brugada[6], Jean-Paul Albenque[3], and Olivier Thomas[2]**

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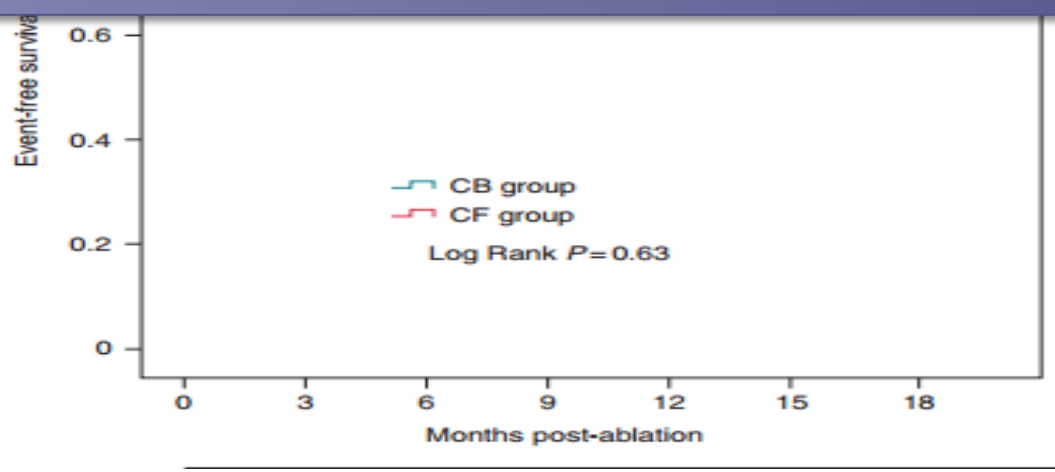
376 paroksismal AF'si olan hastada CF-guided RF ile 2. jenerasyon kriyobalonun PVI izolasyonunda etkinliği ve güvenirliği karşılaştırılmıştır

**Table 2** Procedural data and complications

| | CF group ($n = 198$) | CB group ($n = 178$) | P-Value |
|---|---|---|---|
| Procedural data | | | |
| Procedure duration (min) | 122.5 ± 40.7 | 109.6 ± 40 | 0.003 |
| Fluoroscopy duration (min) | 19.3 ± 8.2 | 17.6 ± 11 | 0.10 |
| X-ray exposure (cGy $cm^2$) | 4273 ± 2934 | 4853 ± 5069 | 0.22 |
| Procedural complications | | | |
| Groin haematoma | 8 (4%) | 3 (1.7%) | 0.17 |
| Transient phrenic nerve palsy | 0 (0%) | 10 (5.6%) | 0.001 |
| Severe complications | | | 0.03 |
| Embolic events | 2 (1%) | 0 (0%) | 0.18 |
| Tamponade | 2 (1%) | 0 (0%) | 0.18 |
| Oesophageal complication | 1 (0.5%) | 0 (0%) | 0.34 |
| Periprocedural death | 0 (0%) | 0 (0%) | NA |
| Total complications | 14 (7.1%) | 13 (7.3%) | 0.93 |

Paroksismal AF'si olan hastada CF-guided RF ile 2. jenerasyon kriyobalonun PVI izolasyonunda benzer etkinlik ve güvenirlikte olduğu gösterilmiştir



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# Pulmonary Vein Isolation Using the Visually Guided Laser Balloon

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

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**TABLE 1 Patient Demographics**

| | VGLB (n = 170) | Control (n = 172) | p Value |
|---|---|---|---|
| Age, yrs | 59.7 ± 10.4 | 60.1 ± 8.9 | 0.69 |
| Sex | | | |
| Male | 118 (69.4) | 109 (63.4) | 0.24 |
| Female | 52 (30.6) | 63 (36.6) | |
| Race | | | 0.51 |
| White | 164 (96.5) | 168 (97.7) | |
| Black | 5 (2.9) | 0 (0) | |
| Asian | 1 (0.6) | 2 (1.2) | |
| Other | 0 (0) | 2 (1.2) | |
| Duration of AF, yrs | 2 (IQR 6.25) | 3 (IQR 5.67) | 0.33 |
| Hypertension | 101 (59.4) | 100 (58.1) | 0.81 |
| Coronary artery disease | 36 (21.2) | 35 (20.3) | 0.85 |
| Myocardial infarction | 7 (4.1) | 7 (4.1) | 0.98 |
| CABG | 5 (2.9) | 7 (4.1) | 0.57 |
| CHF | 9 (5.3) | 4 (2.3) | 0.15 |
| Diabetes mellitus | 26 (15.3) | 17 (9.9) | 0.13 |
| Stroke or TIA | 11 (6.5) | 13 (7.6) | 0.69 |
| Atrial flutter | 42 (24.7) | 41 (23.8) | 0.85 |
| Atrial flutter ablation | 15 (8.8) | 15 (8.7) | 0.97 |
| Ejection fraction, % | 60.6 ± 7.4 | 60.2 ± 7.4 | 0.60 |
| Left atrial diameter, cm | 4.0 ± 0.56 | 4.0 ± 0.55 | 0.61 |
| Antiarrhythmic medications | | | — |
| Class I | 84 (49.4) | 101 (58.7) | |
| Class II | 86 (50.6) | 81 (47.1) | |
| Class III | 98 (57.6) | 99 (57.6) | |

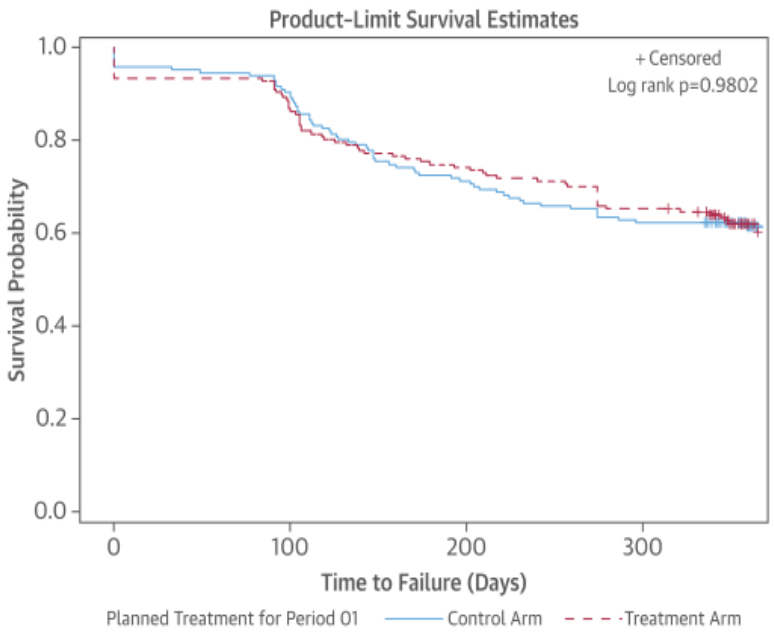
Values are mean ± SD, n (%), or median (IQR).
AF = atrial fibrillation; CABG = coronary artery bypass grafting; CHF = congestive heart failure; IQR = interquartile range; TIA = transient ischemic attack; VGLB = visually guided laser balloon.

**TABLE 2 Procedural Data**

| | VGLB (n = 170) | Control (n = 172) | p Value |
|---|---|---|---|
| Procedure time, min* | 236.0 ± 52.8 | 193.0 ± 63.6 | <0.0001 |
| Ablation time, min† | 173.8 ± 46.6 | 151.2 ± 56.2 | <0.0001 |
| Fluoroscopy time, min | 35.6 ± 18.2 | 29.7 ± 21.0 | 0.006 |
| Number of PVs attempted | 3.9 ± 0.4 | 3.9 ± 0.5 | 0.34 |
| PVs isolated | 649/664 (97.7) | 658/664 (99.1) | 0.05 |
| PVs isolated on first attempt | 583/664 (87.8) | 553/664 (83.3) | 0.02 |
| Attempts per PV to achieve isolation | | | 0.0001 |
| 1 | 583 (89.8) | 553 (84.0) | |
| 2 | 45 (6.9) | 91 (13.8) | |
| 3 | 15 (2.3) | 6 (0.9) | |
| ≥4 | 6 (0.9) | 8 (1.2) | |
| Number of ablation catheters used | 1.2 ± 0.4 | 1.0 ± 0.2 | <0.0001 |
| 1 | 143 (84.1) | 167 (97.1) | <0.0001 |
| 2 | 26 (15.3) | 5 (2.9) | |
| 3 | 1 (0.6) | 0 (0.0) | |
| Additional ablation lesions | 23 (13.5) | 58 (33.7) | <0.0001 |
| CTI ablation | 21 (12.4) | 25 (14.5) | |
| LA roof line | 0 (0.0) | 20 (11.6) | |
| Mitral isthmus line | 1 (0.6) | 3 (1.7) | |
| LA septal line | 0 (0.0) | 5 (2.9) | |
| RA intercaval line | 1 (0.6) | 1 (0.6) | |
| Other | 1 (0.6) | 21 (12.2) | |

Values are mean ± SD, n/N (%), or n (%). *Defined as time from venous access to end of last 30-min wait period. †Defined as time from insertion of catheter to end of last 30-min wait period.
CTI = cavotricuspid isthmus; LA = left atrium; PV = pulmonary vein; RA = right atrium; VGLB = visually guided laser balloon.

**FIGURE 2** Primary Efficacy Endpoint




Per the Kaplan-Meier curves, the primary efficacy endpoint was similar for the VGLB **(red)** and control **(blue)** groups. The abrupt change in both curves at 90 days reflects treatment failure following the end of the blanking period. VGLB = visually guided laser balloon.

**TABLE 3** Primary Adverse Events

| | 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) | |

Values are n (%). *The total PAE rate reflects the number of patients experiencing a PAE rather than the total of the number of PAEs.

PAE = primary adverse event(s); other abbreviations as in Tables 1 and 2.

# **Pulmonary Vein Isolation Using the Visually Guided Laser Balloon:** Results of the U.S. Feasibility Study

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From the *Helmsley Electrophysiology Center, Icahn School of Medicine at Mount Sinai, New York, New York; †Sentara Cardiovascular Research Institute, Norfolk, Virginia; ‡University of Alabama at Birmingham, Birmingham, Alabama; §Pacific Heart Institute, Santa Monica, California; ¶University of California San Francisco School of Medicine, San Francisco, California; #William Beaumont Hospital, Royal Oak, Michigan; ‖The Methodist Hospital, Houston, Texas; **University of Virginia, Charlottesville, Virginia; ††Massachusetts General Hospital, Boston, Massachusetts; and ‡‡Texas Cardiac Arrhythmia Institute, Austin, Texas, USA

**Visually Guided PV Isolation.** ***Introduction:*** **Visually guided laser balloon (VGLB) ablation is unique in that the operator delivers ablative energy under direct visual guidance. In this multicenter study, we sought to determine the feasibility, efficacy, and safety of performing pulmonary vein isolation (PVI) using this VGLB.**

***Methods:*** **Patients with symptomatic, drug-refractory paroxysmal atrial fibrillation (AF) underwent PVI using the VGLB with the majority of operators conducting their first-ever clinical VGLB cases. The primary effectiveness endpoint was defined as freedom from treatment failure that included: Occurrence of symptomatic AF episodes ≥1 minutes beyond the 90-day blanking, the inability to isolate 1 superior and 2 total PVs, occurrence of left atrial flutter or atrial tachycardia, or left atrial ablation/surgery during follow-up.**

***Results:*** **A total of 86 patients (mean age 56 ± 10 years, 67% male) were treated with the VGLB at 10 US centers. Mean fluoroscopy, ablation, and procedure times were 39.8 ± 24.3 minutes, 205.2 ± 61.7 minutes, and 253.5 ± 71.3 minutes, respectively. Acute PVI was achieved in 314/323 (97.2%) of targeted PVs. Of 84 patients completing follow-up, the primary effectiveness endpoint was achieved in 50 (60%) patients. Freedom from symptomatic or asymptomatic AF was 61%. The primary adverse event rate was 16.3% (8.1% pericarditis, phrenic nerve injury 5.8%, and cardiac tamponade 3.5%). There were no cerebrovascular events, atrioesophageal fistulas, or significant PV stenosis.**

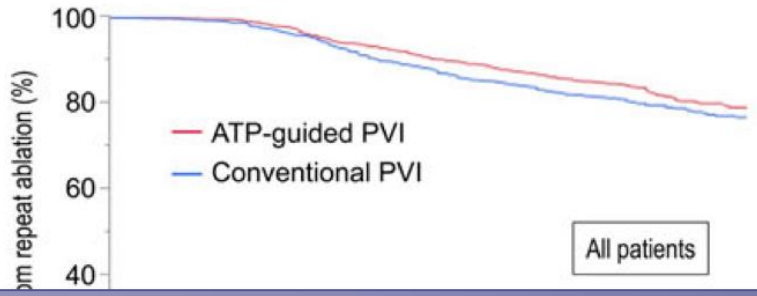
***Conclusions:*** **This multicenter study of operators in the early stage of the learning curve demonstrates that PVI can be achieved with the VGLB with a reasonable safety profile and an efficacy similar to radiofrequency ablation.** *(J Cardiovasc Electrophysiol, Vol. 26, pp. 944-949, September 2015)*

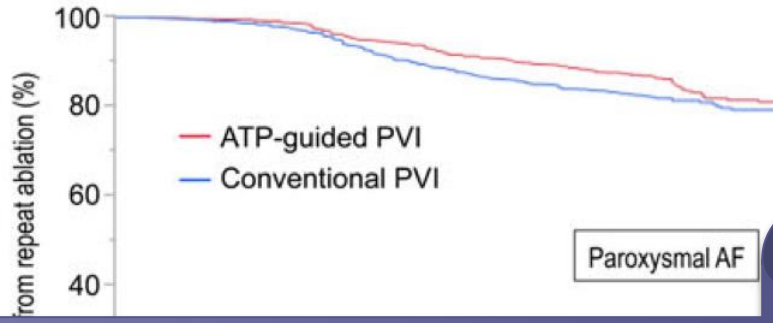
# Adenosine triphosphate-guided pulmonary vein isolation for atrial fibrillation: the UNmasking Dormant Electrical Reconduction by Adenosine TriPhosphate (UNDER-ATP) trial

- Paroksismal, persistent/uzun süreli persistent AF'li 2113 hasta
- 1112'si adenozin kılavuzluğunda ablasyona, 1001'i konvansiyonel ablasyon koluna randomize
- Primer sonlanım 3 ay-12 ay arasındaki atriyal taşikardi tekrarı

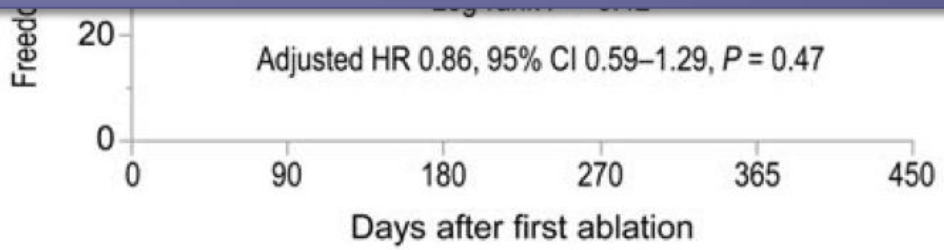
Eur Heart J. 2015 Dec 7;36(46):3276-87.

- Adenozinin ablasyon sonrası sol atrium pulmoner ven arasındaki dormant (etkin olmayan, uyku halindeki) iletimi uyardığı gösterilmiştir
- Adenozin klavuzluğuna dormant iletim kaybolana kadar ilave ablasyon yapılması yaklaşımı önerilmiştir




- Bir yılda, adenozin kolundaki hastalar ile konvansiyonel ablasyon kolundaki hastaların atriyal aritmi rekürrensi (p=0.25) ve tekrar ablasyon oranları benzer bulunmuştur.
- Sonuçlar paroksismal AF ile persistent/uzun süreli persistent AF alt gruplarında da aynıdır.



# Adenosine-guided pulmonary vein isolation for the treatment of paroxysmal atrial fibrillation: an international, multicentre, randomised superiority trial

*Laurent Macle, Paul Khairy, Rukshen Weerasooriya, Paul Novak, Atul Verma, Stephan Willems, Thomas Arentz, Isabel Deisenhofer, George Veenhuyzen, Christophe Scavée, Pierre Jaïs, Helmut Puererfellner, Sylvie Levesque, Jason G Andrade, Lena Rivard, Peter G Guerra, Marc Dubuc, Bernard Thibault, Mario Talajic, Denis Roy, Stanley Nattel, for the ADVICE trial investigators**

| | Dormant conduction | | No dormant conduction | |
|---|---|---|---|---|
| | No further ablation (n=137) | Additional ablation (n=147) | Registry group (n=117) | Routine follow-up (n=133) |
| Age (years) | 58·4 (9·7) | 60·2 (9·9) | 58·9 (10·9) | 60·4 (10·4) |
| Men | 97 (70·8%) | 108 (73·5%) | 87 (74·4%) | 86 (64·7%) |
| Duration of atrial fibrillation (years) | 3·4 (1·7–8·0) | 4·0 (1·5–7·0) | 3·0 (1·3–8·0) | 4·0 (2·0–8·2) |
| Antiarrhythmic drugs failed in the past | 2·6 (1·1) | 2·6 (1·2) | 2·6 (1·2) | 2·5 (1·2) |
| $CHADS_2$ score* | | | | |
| 0 | 76 (55·5%) | 72 (49·0%) | 56 (47·9%) | 64 (48·1%) |
| 1 | 47 (34·3%) | 54 (36·7%) | 44 (37·6%) | 45 (33·8%) |
| 2 | 12 (8·8%) | 14 (9·5%) | 12 (10·3%) | 19 (14·3%) |
| ≥3 | 2 (1·5%) | 7 (4·8%) | 5 (4·3%) | 5 (3·8%) |
| Hypertension | 50 (36·5%) | 62 (42·2%) | 54 (46·2%) | 54 (40·6%) |
| Ischaemic heart disease | 15 (10·9%) | 16 (10·9%) | 10 (8·5%) | 14 (10·5%) |
| Congestive heart failure | 5 (3·6%) | 4 (2·7%) | 3 (2·6%) | 4 (3·0%) |
| Diabetes | 6 (4·4%) | 8 (5·4%) | 11 (9·4%) | 8 (6·0%) |
| Previous stroke or transient ischaemic attack | 5 (3·6%) | 8 (5·4%) | 4 (3·4%) | 12 (9·0%) |
| Left atrial size, parasternal long axis (mm) | 39·6 (5·9) | 40·1 (4·5) | 40·1 (4·9) | 39·9 (5·4) |
| Left ventricular ejection fraction (%) | 60·1 (7·1) | 59·9 (5·9) | 59·1 (6·6) | 60·2 (5·8) |

# Adenosine-guided pulmonary vein isolation for the treatment of paroxysmal atrial fibrillation: an international, multicentre, randomised superiority trial

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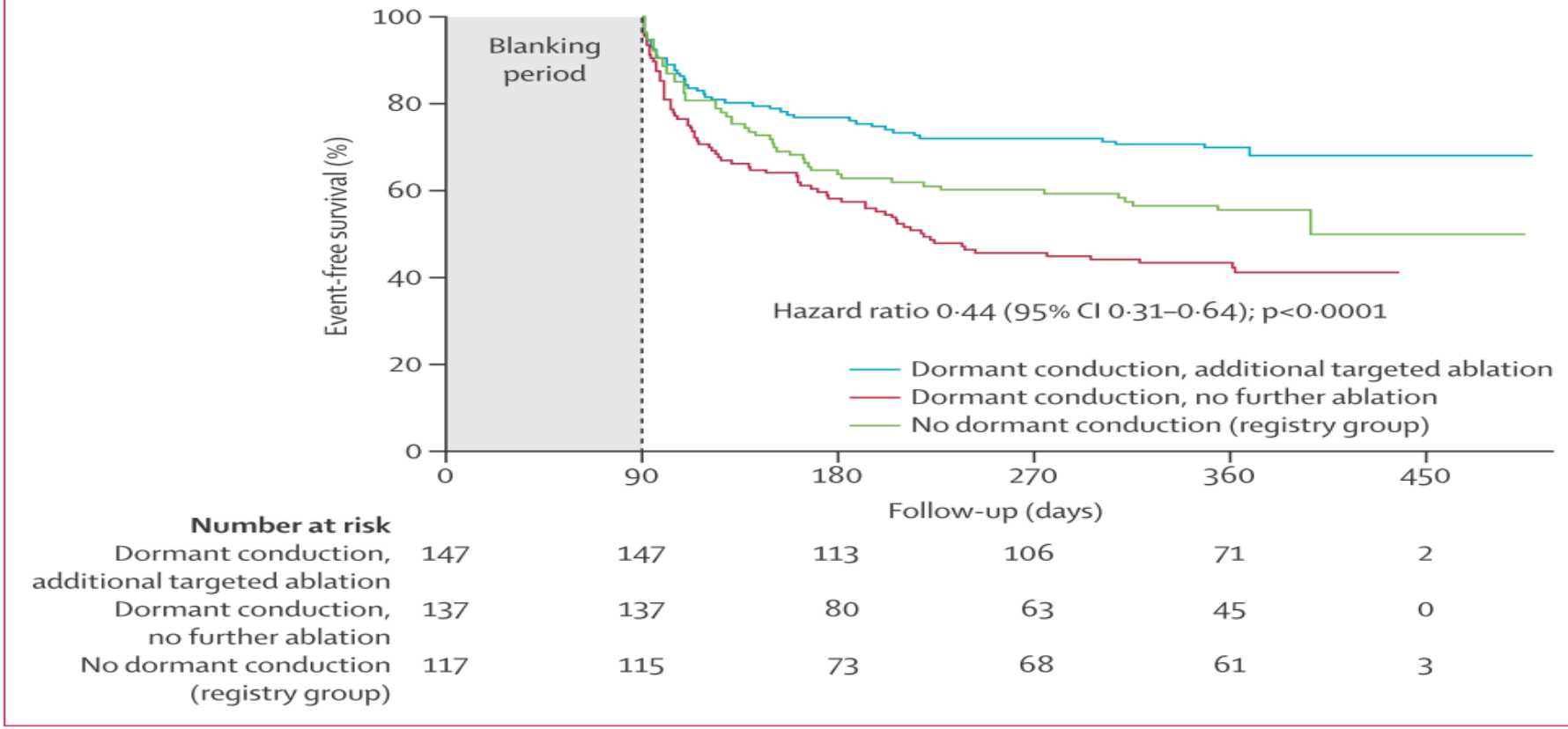


***Figure 2:*** **Freedom from symptomatic atrial tachyarrhythmia after a single ablation procedure (primary endpoint)**
The hazard ratio is for the comparison between dormant conduction, additional targeted ablation versus dormant conduction, no further ablation.

# Adenosine-guided pulmonary vein isolation for the treatment of paroxysmal atrial fibrillation: an international, multicentre, randomised superiority trial

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| | Dormant conduction, no further ablation (n=137) | Dormant conduction, additional ablation (n=147) | No dormant conduction registry group (n=115) | Dormant conduction with additional ablation *vs* dormant conduction with no further ablation | | Dormant conduction with no further ablation *vs* no dormant conduction | | Dormant conduction with additional ablation *vs* no dormant conduction | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Hazard ratio (95% CI) | p value | Hazard ratio (95% CI) | p value | Hazard ratio (95% CI) | p value |
| **Primary endpoint** | | | | | | | | | |
| Freedom from symptomatic atrial tachyarrhythmia, after a single ablation procedure | 58 (42·3%) | 102 (69·4%) | 64 (55·7%) | 0·44 (0·31–0·64) | <0·0001 | 1·44 (1·01–2·05) | 0·0191 | 0·64 (0·43–0·95) | 0·0192 |
| **Key secondary endpoints** | | | | | | | | | |
| Freedom from any atrial tachyarrhythmia, after a single ablation procedure | 54 (39·4%) | 96 (65·3%) | 62 (53·9%) | 0·47 (0·33–0·67) | <0·0001 | 1·50 (1·06–2·12) | 0·0092 | 0·70 (0·48–1·04) | 0·0505 |
| Freedom from symptomatic atrial tachyarrhythmia off antiarrhythmic drugs, after a single ablation procedure | 54 (39·4%) | 94 (63·9%) | 58 (50·4%) | 0·52 (0·37–0·73) | <0·0001 | 1·31 (0·94–1·84) | 0·0615 | 0·68 (0·47–0·98) | 0·0263 |
| Freedom from any atrial tachyarrhythmia, off antiarrhythmic drugs, after a single ablation procedure | 51 (37·2%) | 88 (59·9%) | 56 (48·7%) | 0·55 (0·39–0·76) | 0·0002 | 1·35 (0·97–1·88) | 0·0421 | 0·74 (0·51–1·06) | 0·0639 |

# Sonuç

- Paroksismal AF'de ne zaman ve hangi yöntemle ablasyon yapmalıyız?
- Hangi persistan AF hastasına ablasyon önerilmeli ve hangi yöntemi tercih etmeliyiz?
- Kriyobalon ablasyonla  240 msn çift kez mi tek kez mi dondurma işlemi yapmalıyız?
- Kriyobalon ablasyonla 240 msn veya 180 msn çift sefer mi  dondurma işlemi yapmalıyız?
- Kriyobalon ablasyonla 180 msn tek sefer mi  dondurma işlemi yapmalıyız?

- AF ablasyonunda yeni ablasyon yöntemlerini ne zaman tercih etmeliyiz?
- Adenozin-guided AF ablasyonunu günlük pratikte uygulamalı mıyız?


Soru ya da katkılarınız ??

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

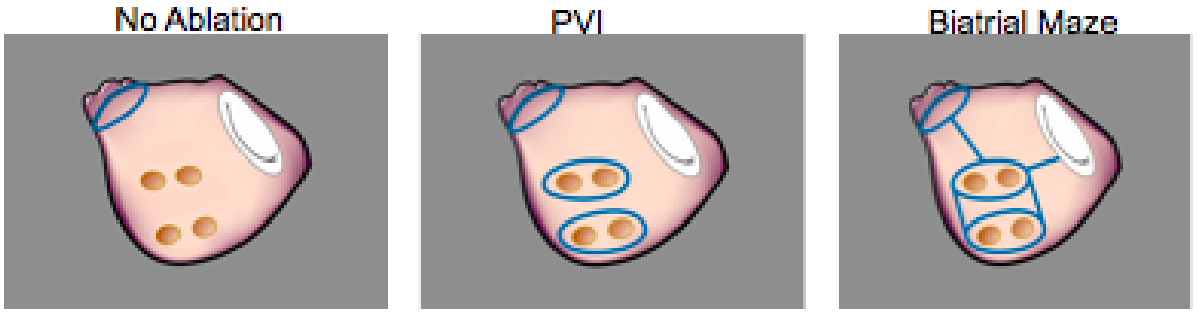
# Surgical Ablation of Atrial Fibrillation during Mitral-Valve Surgery

A. Marc Gillinov, M.D., Annetine C. Gelijns, Ph.D., Michael K. Parides, Ph.D., Joseph J. DeRose, Jr., M.D., Alan J. Moskowitz, M.D., Pierre Voisine, M.D., Gorav Ailawadi, M.D., Denis Bouchard, M.D., Peter K. Smith, M.D., Michael J. Mack, M.D., Michael A. Acker, M.D., John C. Mullen, M.D., Eric A. Rose, M.D., Helena L. Chang, M.S., John D. Puskas, M.D., Jean-Philippe Couderc, Ph.D., Timothy J. Gardner, M.D., Robin Varghese, M.D., Keith A. Horvath, M.D., Steven F. Bolling, M.D., Robert E. Michler, M.D., Nancy L. Geller, Ph.D., Deborah D. Ascheim, M.D., Marissa A. Miller, D.V.M., Emilia Bagiella, Ph.D., Ellen G. Moquete, R.N., Paula Williams, M.S., Wendy C. Taddei-Peters, Ph.D., Patrick T. O'Gara, M.D., Eugene H. Blackstone, M.D., and Michael Argenziano, M.D., for the CTSN Investigators*

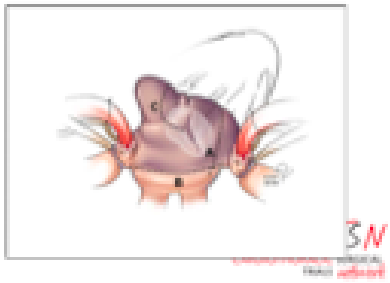
Persistan ya da uzun süreli persistan atriyal fibrilasyonu olan ve açık mitral cerrahi yapılacak hastalarda başarılı ablasyon uzun dönem sonuçları iyileştirebilir mi?

N Engl J Med. 2015 Apr 9;372(15):1399-409.

## Surgical Ablation Options



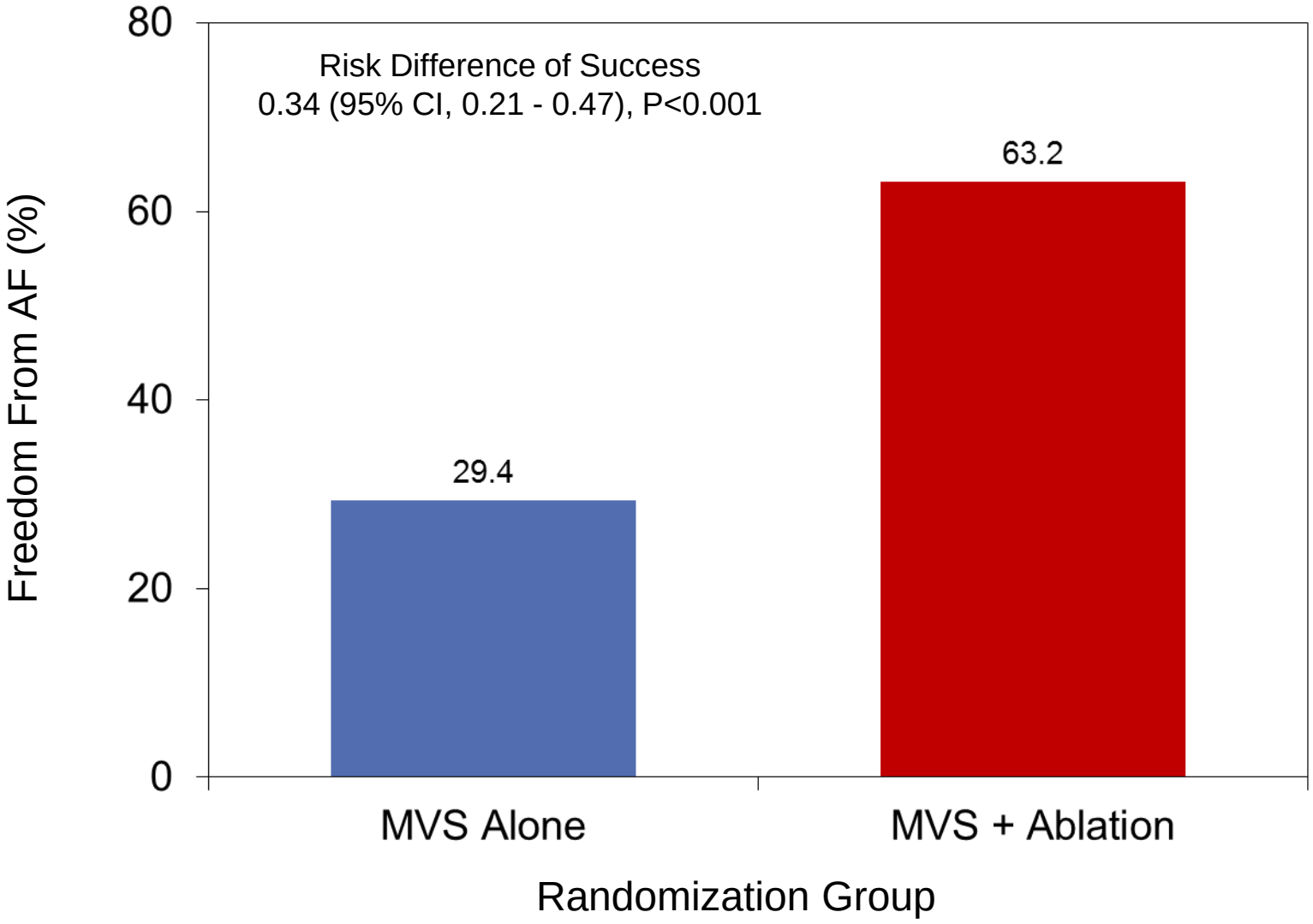

**LAA closure performed in all patients**



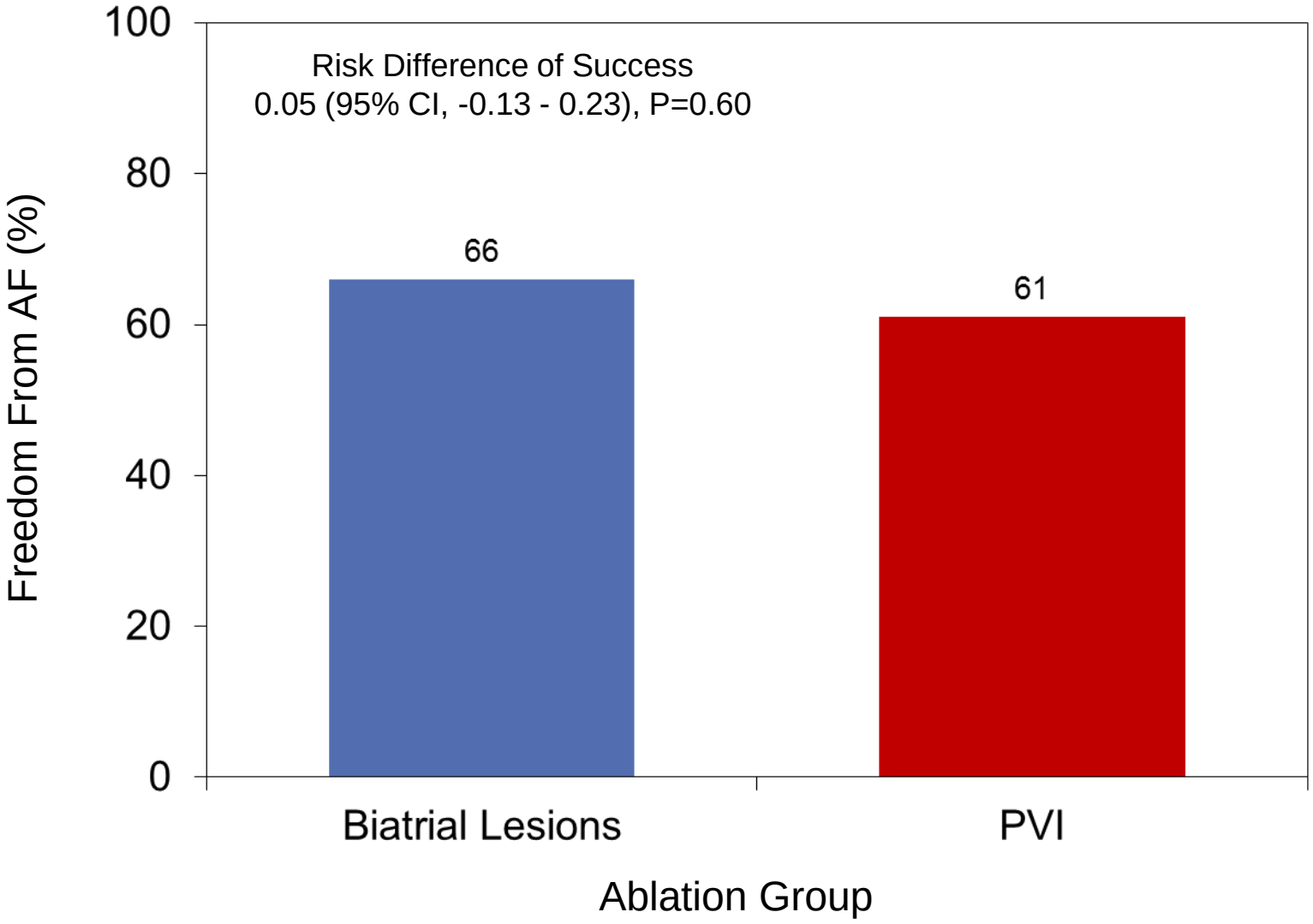
- Mitral kapak cerrahisine gidecek persistan ve uzun süreli persistan AF

- İki farklı ablasyon yönteminin AF'siz dönem açısından (pulmoner ven izolasyonu  ya da biatrial maze prosedürü) karşılaştırılması

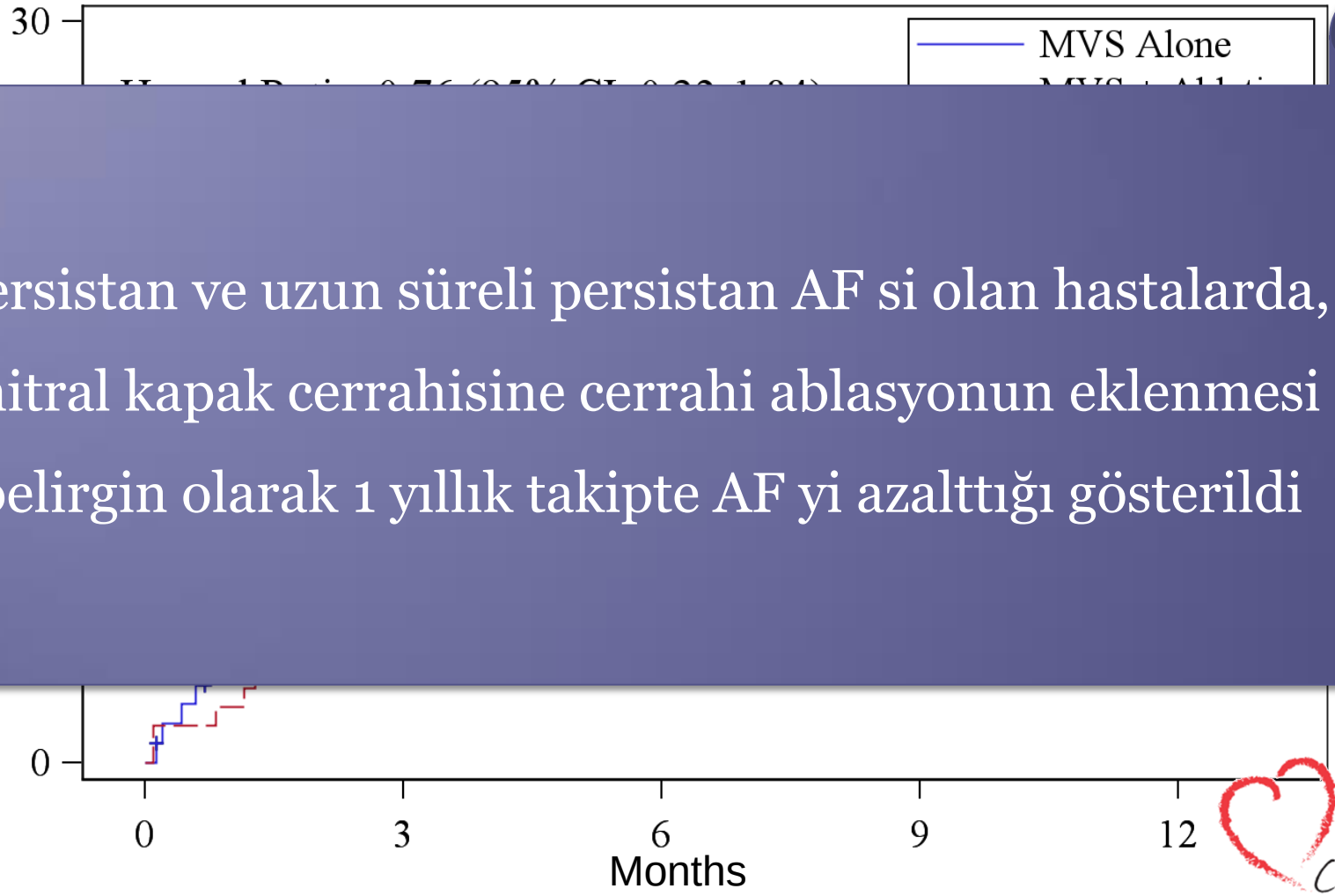
# Primer Sonlanım



# Biatriyal Maze vs. PVI



# Mortalite




Persistan ve uzun süreli persistan AF si olan hastalarda, mitral kapak cerrahisine cerrahi ablasyonun eklenmesi belirgin olarak 1 yıllık takipte AF yi azalttığı gösterildi

CTSN CARDIOTHORACIC SURGICAL TRIALS network