





# Paroxysmal AF ablation for index and redo procedure:

**Cryo:** Olivier Thomas **RF:** Stephane Combes

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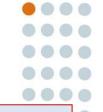




# No conflict of interest







no valid study comparing the latest technological advances of these two energies....



#### **REVIEWS**

### Comparison of catheter ablation for paroxysmal atrial fibrillation between cryoballoon and radiofrequency: a meta-analysis

Chao-feng Chen¹ • Xiao-fei Gao¹ • Xu Duan¹ • Bin Chen¹ • Xiao-hua Liu¹ • Yi-zhou Xu¹.²

#### CB **Odds Ratio Odds Ratio** Events Total Events Total M-H, Random, 95% CI Study or Subgroup Weight M-H, Random, 95% Cl 4.1.1 CB1 vs nonCF-RF Akerstrom F et al 2014 0.62 [0.32, 1.19] 13 215 39 415 3.5% Antoli \* c B et al 2016 12 23 10 18 1.4% 0.87 [0.25, 3.01] Hofmann R et al 2010 11 24 43 2.2% 0.35 [0.14, 0.88] 26 78 41 77 3.5% 0.44 [0.23, 0.84] Hunter R et al 2015 100 Julia J et al 2014 23 186 4.0% 0.75 [0.43, 1.32] Khoueiry Z et al 2016 53 311 376 5.1% 1.25 [0.83, 1.89] Knecht S et al 2014 23 2.8% 1.00 [0.46, 2.18] Kojodjojo P et al 2010 21 90 15 53 2.8% 0.77 [0.36, 1.67] 0.90 [0.64, 1.28] Kuck KH et al 2016 80 374 376 5.7% Kuhne M et al 2010 25 1.57 [0.24, 10.30] Linhart M et al 2010 9 20 11 20 1.4% 0.67 [0.19, 2.33] Luik A et al 2015 41 156 159 4.5% 0.85 [0.52, 1.39] 136 Mugnai G et al 2014 50 111 260 5.0% 0.78 [0.51, 1.20] Perez-Cas N et al 2014 13 25 25 1.6% 2.30 [0.73, 7.27] Pokushalov E et al 2013 18 29 14 34 1.9% 2.34 [0.85, 6.45] 92 393 158 467 Providencia R et al 2016 0.60 [0.44, 0.81] 53 Schmidt M et al 2014 905 161 2879 5.9% 1.05 [0.76, 1.45] 703 1699 Schmidt M et al 2016 268 607 6.9% 1.12 [0.93, 1.35] Siklody CH et al 2012 2 32 (0.72 7.41) Straube F et al 2015 107 99 3.9% 0.63 [0.35, 1.12] 31 39 39 Wasserlauf J et al 2015 40 101 100 4.0% 1.03 [0.58, 1.81] Subtotal (95% CI) 3812 7392 74.3% 0.87 [0.74, 1.03] 1644 Heterogeneity: $Tau^2 = 0.05$ ; $Chi^2 = 37.35$ , df = 20 (P = 0.01); $I^2 = 46\%$ Test for overall effect Z = 1.60 (P = 0.11) 4.1.2 CB2 vs nonCF-RF Aryana A et al 2015 128 593 126 423 6.2% 0.65 [0.49, 0.86] Aryana A et al 2016 224 1126 0.51 [0.42, 0.62] Miyazaki S et al 2015 13 1.5% 0.23 [0.07, 0.79] Subtotal (95% CI) 1760 1340 14.4% 0.54 [0.41, 0.71] Heterogeneity: $Tau^2 = 0.03$ ; $Chi^2 = 3.70$ , df = 2 (P = 0.16); $I^2 = 46\%$ 4.1.3 CB2 vs CF-RF Jourda F et al 2014 1.26 [0.49, 3.24] 2.2% Kardos A et al 2016 40 20 2.5% 0.91 [0.39, 2.15] 38 0.71 [0.26, 1.96] Nagy Z et al 2016 1.9% Squara F et al 2015 178 4.7% 1.15 [0.72, 1.84] Subtotal (95% CI) 331 1.06 [0.74, 1.51] Heterogeneity: $Tau^2 = 0.00$ ; $Chi^2 = 0.96$ , df = 3 (P = 0.81); $I^2 = 0\%$ 9121 100.0% Total (95% CI) 0.83 [0.70, 0.97] 1325 2160 Heterogeneity: Tau2 = 0.09; Chi2 = 72.13, df = 27 (P < 0.00001); I2 = 63% Test for overall effect: Z = 2.28 (P = 0.02) CB RF Test for subgroup differences: $Chi^2 = 11.19$ , df = 2 (P = 0.004), $I^2 = 82.1\%$

## **Atrial arythmia recrudescence**

## J Interv card Electrophysiol Dec 2016

Conclusion Available overall and subgroup data suggested that both CB1 and CB2 were more beneficial than RF ablation, and the main advantages were reflected in comparing them with non-CF-RF. However, CF-RF and CB2 showed similar clinical benefits.

Can we conclude on this data particulary with regard to new device?

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# Cryoballoon versus Radiofrequency Catheter Ablation in Atrial Fibrillation: A Meta-Analysis

RHANDERSON CARDOSO, M.D., RODRIGO MENDIRICHAGA, M.D., GILSON FERNANDES, M.D., CHRIS HEALY, M.D., LITSA K. LAMBRAKOS, M.D., JUAN F. VILES-GONZALEZ, M.D., JEFFREY J. GOLDBERGER, M.D., and RAUL D. MITRANI, M.D.

From the Division of Cardiology, Department of Medicine, University of Miami, Jackson Memorial Hospital, Miami, Florida, USA

**JCE oct 2016** 

Cryo ablation vs. Radiofrequency ablation for treatment of paroxysmal atrial fibrillation: a systematic review and meta-analysis

Chen YH, Lu ZY, Xiang Y, Hou JW, Wang Q, Lin H, Li YG

## Europace 2017

### "CONCLUSIONS:

Compared with RF ablation, cryoablation present a comparable long-term AF/atrial tachycardial-free survival and procedure-related adverse events. Meanwhile, cryoablation markedly shorten the procedure time, nonetheless, with negligible impact on the fluoroscopy time."

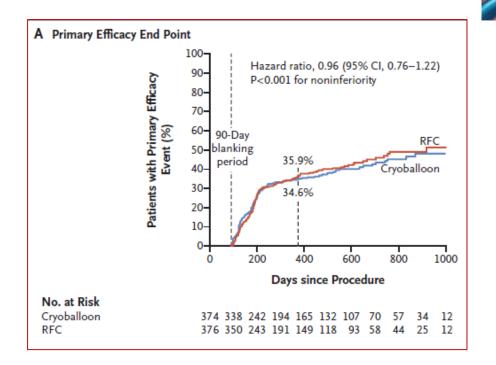


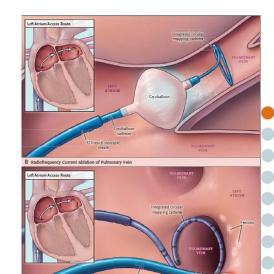
#### ORIGINAL ARTICLE

# Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

Karl-Heinz Kuck, M.D., Josep Brugada, M.D., Alexander Fürnkranz, M.D., Andreas Metzner, M.D., Feifan Ouyang, M.D., K.R. Julian Chun, M.D., Arif Elvan, M.D., Ph.D, Thomas Arentz, M.D., Kurt Bestehorn, M.D., Stuart J. Pocock, Ph.D., Jean-Paul Albenque, M.D., Ph.D., and Claudio Tondo, M.D., Ph.D., for the FIRE AND ICE Investigators\*

## 2016





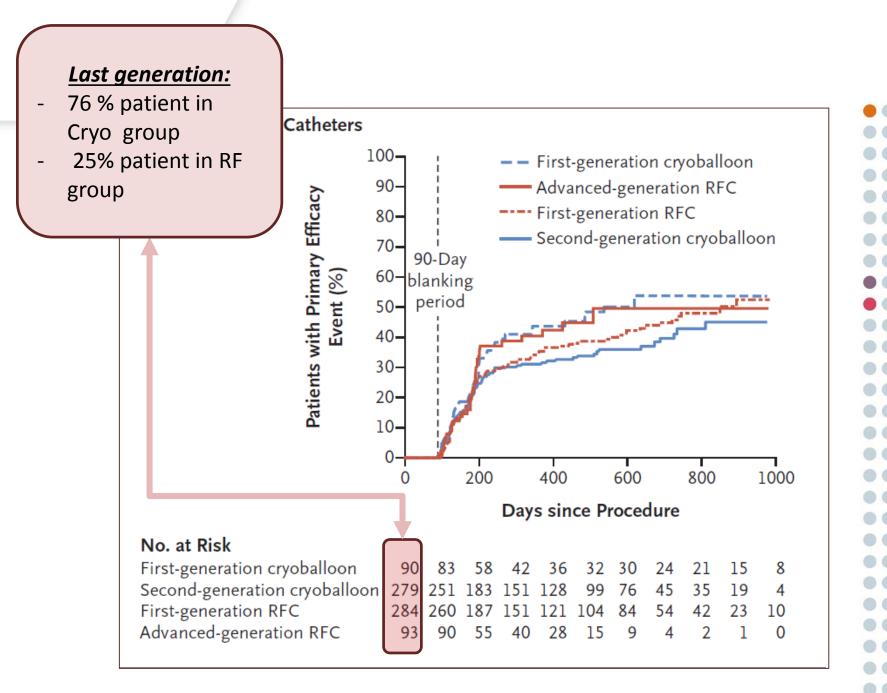


# Multicentric Study ....?

| Investigator  | Center   | Country         | Enrolled | Treated  |
|---|--|-----------------|----------|----------|
|   |  |                 | Subjects | Subjects |
| Karl-Heinz Kuck<br>Andreas Metzner<br>Feifan Ouyang | Asklepios Klinik St. Georg                                       | Germany         | 162      | 157      |
| Julian Chun<br>Alexander Fürnkranz                  | Cardioangiologisches Centrum<br>Bethanien                        | Germany         | 136      | 131      |
| Arif Elvan  | Isala Klinieken Zwolle   | The Netherlands | 78       | 74       |
| Thomas Arentz                                       | Herz-Zentrum Bad Krozingen                                       | Germany         | 67       | 66       |
| Michael Kühne<br>Christian Sticherling              | Universitätsspital Basel   | Switzerland     | 50       | 50       |
| Laszlo Gellér                                       | Semmelweis Egyetem Budapest                                      | Hungary         | 47       | 47       |
| Matthias Busch                                      | Uniklinik Greifswald   | Germany         | 35       | 33       |
| Josep Brugada<br>Lluis Mont                         | Hospital Clinic de Barcelona                                     | Spain           | 32       | 32       |
| Alberto Barrera                                     | Hospital Clínico Universitario<br>"Virgen de la Victoria" Malaga | Spain           | 30       | 30       |
| Thomas Deneke                                       | Klinikum Bad Neustadt  | Germany         | 27       | 26       |
| Jean-Paul Albenque                                  | Clinique Pasteur Toulouse  | France          | 26       | 26       |
| Volker Kühlkamp                                     | Herz-Zentrum Bodensee  | Germany         | 22       | 22       |
| Claudio Tondo                                       | Centro Cardiologico Monzino,<br>University of Milan              | Italy           | 18       | 18       |
| Ricardo Ruiz-Granell                                | Hospital Clinico Universitario<br>Valencia                       | Spain           | 17       | 16       |
| Petr Neuzil   | NA Homolce Hospital Prague                                       | Czech Republic  | 12       | 12       |
| Nicasio Pérez-Castellano                            | Hospital Clinico San Carlos, Madrid                              | Spain           | 10       | 10       |
| TOTAL   |  |                 | 769      | 750      |

40%







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Pulmonary vein isolation using "contact force" ablation: MARIJON, M.D., Ph.D.,\*,† SAMIA FAZAA, M.D.,\* KUMAP CONTACT TREGUER, M.D., M.S.,\* NIT Vein isolation using and long-term study and long-term study.

With a Contact Reguer, M.D., M.S.,\* NIT Vein isolation using and long-term study and long-term study.

With a Contact Reguer, M.D., M.S.,\* NIT Vein isolation and long-term study.

With a Contact Reguer, M.D., M.S.,\* NIT Vein isolation and long-term study.

A prospective study and long-term study.

With a Contact Reguer, M.D., M.S.,\* NIT Vein isolation and long-term study.

A prospective study.

N.D., Ph.D.,\*,† SAMIA FAZAA, M.D.,\* KUMAP Conduction and long-term study.

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N.D., Ph.D.,\*,† SAMIA FAZAA, M.D.,\* KUMAP Conduction and long-term study.

N.D., \*\*SERGE BOVP\*\*

N.D., \*\*SERGE BO Real-Time Contact Force Sensing for Pulmonary Vein Isolation in the Setting of Paroxysmal Atrial Fibrillation: Procedural and Scott J. rollak, MD, raul Knairy, MD, MSC, Marc Deyell, MD, MSC, Mario Talajic, MD, FHRS, Stanley Nattel, Mn. Peter G. Guerra, MD, Stanley Nattel Impact of Contact Force Technology on Atrial Fibrillation Ablation. With a Contact Cathe The Results of the Prosper Results of the Prospective, Multi-Monarined Shurath, MO, Mastersley, MO, Hroden becomes MO, Heros Reported to the Shurath MO, Heros Reported to the Monarine design of the Andrea Natale, MD, \*#\$//¶ Vivek v H. Thomas McEldeny, M. Douglas L. Pack ajs2 • arent Pison 1 Contact force-guided catheter ablation for the treatment of atrial fibrillation: a meta-analysis of David Newman, MIT, Ian Lashersey, MO, Hroshi Nakagawa, MO, Phot, Eugene Crystal, MO, Anna Kaoutska, MO, Hroshi Nakagawa, MO, Phot, Eugene Crystal, MO, Hroshi Nakagawa, MO, Hroshi Naka randomized, controlled trials Z. Qi\*, X. Luo\*, B. Wu, H. Shi, B. Jin and Z. Wen :mproves outce Paroxysmal. Department of Cardiology, Huashan Hospital, Fudan University, Shanghai, China EFICAS II: OPTI Wichtene Lenk Wissi. Zil, Hendrik Lambert Jasteur.com A Meta-Analysis Arrhythmia/Electro Randomized, Controlled Trial of t. of a Contact Force–Sensing Irrigata of Paroxysmal Atrial Fr ALONSO PEDROTE, M.D., Ph.D., \* EDUARDO ARANA-RUEDA, M.D., Ph.D., \* JOSÉ LUIS MARTOS-MAINE, M.D., MANUEL FRUTOS-LÓPEZ, M.D., Results of the TactiCath Contact Force Ablation \_atheter Study | JUAN SÁNCHEZ-BROTONS, M.D., and LORENA GARCÍA-RIESCO, M.D. Fibrillation (TOCCASTAR) Study



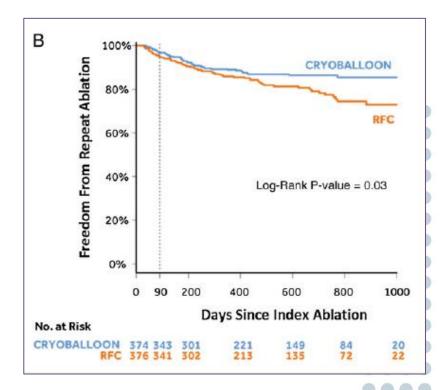
#### FASTTRACK CLINICAL RESEARCH

Atrial fibrillation

Cryoballoon or radiofrequency ablation for symptomatic paroxysmal atrial fibrillation: reintervention, rehospitalization, and quality-of-life outcomes in the FIRE AND ICE trial

Karl-Heinz Kuck1\*, Alexander Fürnkranz2, K.R. Julian Chun2, Andreas Metzner1, Feifan Ouyang<sup>1</sup>, Michael Schlüter<sup>1</sup>, Arif Elvan<sup>3</sup>, Hae W. Lim<sup>4</sup>, Fred J. Kueffer<sup>4</sup>, Thomas Arentz<sup>5</sup>, Jean-Paul Albenque<sup>6</sup>, Claudio Tondo<sup>7</sup>, Michael Kühne<sup>8</sup>, Christian Sticherling<sup>8</sup>, and Josep Brugada<sup>9</sup>, on behalf of the FIRE AND ICE Investigators

2016

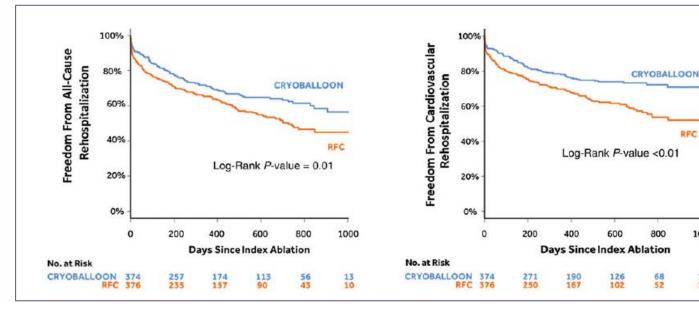


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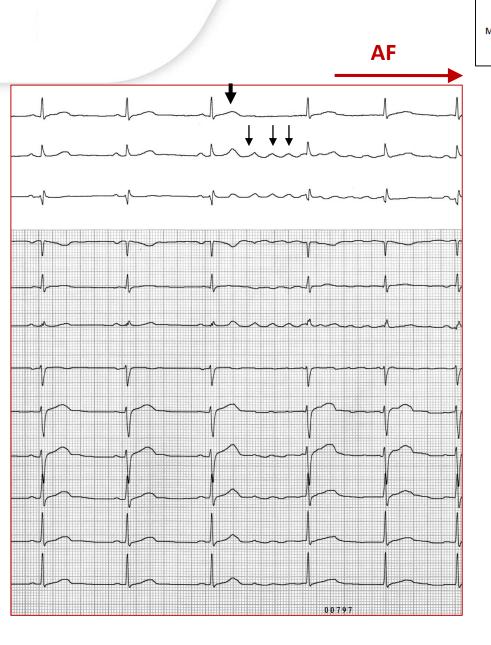
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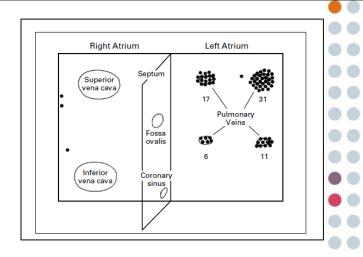
# Is there only one type of paroxysmal AF?

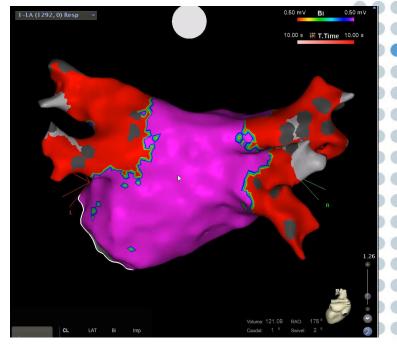




## SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

MICHEL HAÏSSAGUERRE, M.D., PIERRE JAÏS, M.D., DIPEN C. SHAH, M.D., ATSUSHI TAKAHASHI, M.D., MÉLÈZE HOCINI, M.D., GILLES QUINIOU, M.D., STÉPHANE GARRIGUE, M.D., ALAIN LE MOUROUX, M.D., PHILIPPE LE MÉTAYER, M.D., AND JACQUES CLÉMENTY, M.D.





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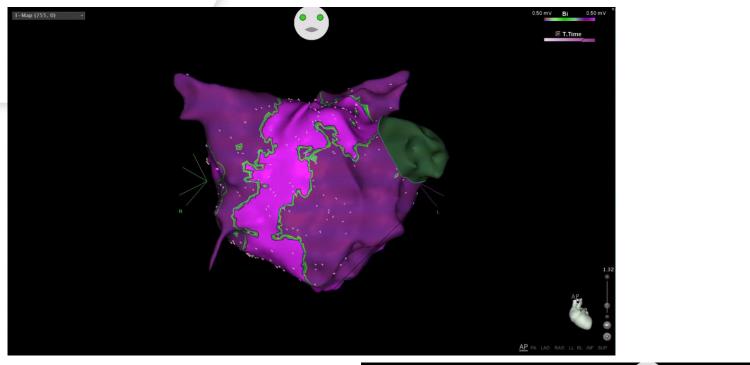
# What is the definition of paroxysmal AF

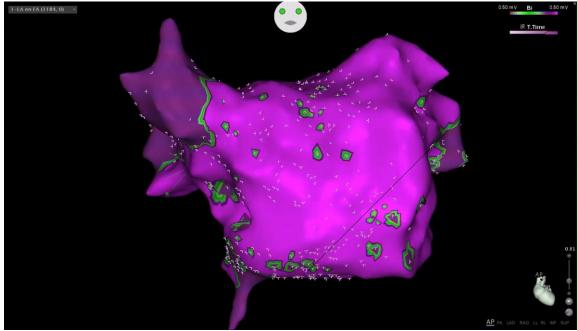
# 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC)

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

| AF pattern                  | Definition  |  |
|-----------------------------|---|--|
| First diagnosed<br>AF       | AF that has not been diagnosed before, irrespective of the duration of the arrhythmia or the presence and severity of AF-related symptoms.  |  |
| Paroxysmal AF               | Self-terminating, in most cases within 48 hours.  Some AF paroxysms may continue for up to 7 days. <sup>a</sup> AF episodes that are cardioverted within 7 days should be considered paroxysmal. <sup>a</sup>   |  |
| Persistent AF               | AF that lasts longer than 7 days, including episodes that are terminated by cardioversion, either with drugs or by direct current cardioversion, after 7 days or more.  |  |
| Long-standing persistent AF | Continuous AF lasting for ≥1 year when it is decided to adopt a rhythm control strategy.  |  |
| Permanent AF                | AF that is accepted by the patient (and physician). Hence, rhythm control interventions are, by definition, not pursued in patients with permanent AF. Should a rhythm control strategy be adopted, the arrhythmia would be re-classified as 'long-standing persistent AF'. |  |



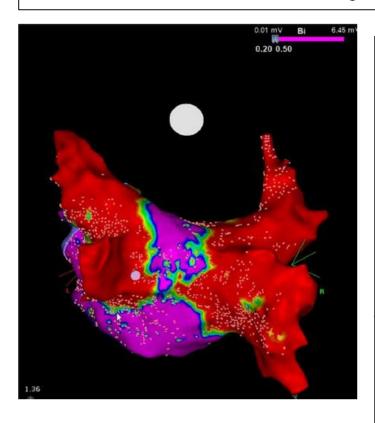


Quantification of the cryoablation zone demarcated by pre- and postprocedural electroanatomic mapping in patients with atrial fibrillation using the 28-mm second-generation cryoballoon

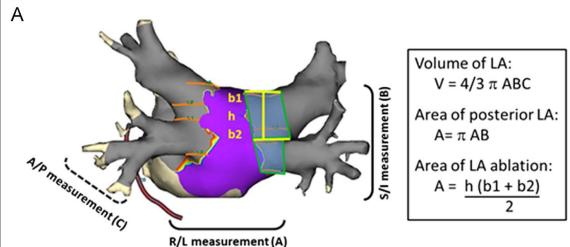
David N. Kenigsberg, MD, FHRS,\* Natalia Martin, BS,1† Hae W. Lim, PhD,‡ Marcin Kowalski, MD, FHRS, Kenneth A. Ellenbogen, MD, FHRS

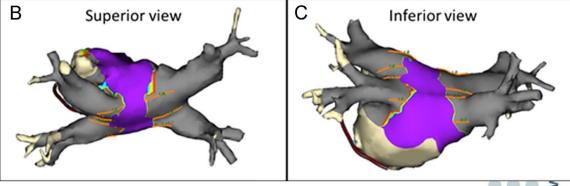
## Heart Rhythm 2015





Only 27% of posterior wall was not ablated

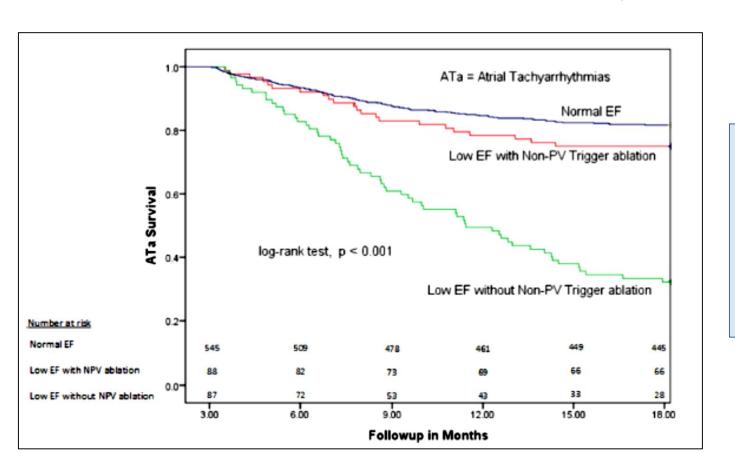




# Importance of non-pulmonary vein triggers

Importance of non-pulmonary vein triggers ablation to achieve long-term freedom from paroxysmal atrial fibrillation in patients with low ejection fraction ©

## Zhao Y et al, Heart Rhythm 2016



720 patients
Prospective study
2 groups
LVEF≤ 35%
LVEF≥ 50%

AF Ablation Guided by Spatiotemporal Electrogram Dispersion Without Pulmonary Vein Isolation

A Wholly Patient-Tailored Approach

Julien Seitz, MD, <sup>a</sup> Clément Bars, MD, <sup>a</sup>, <sup>b</sup> Guillaume Théodore, MD, <sup>c</sup> Sylvain Beurtheret, MD, <sup>a</sup> Nicolas Lellouche, MD, PhD, <sup>d</sup> Michel Bremondy, MD, <sup>a</sup> Ange Ferracci, MD, <sup>a</sup> Jacques Faure, MD, <sup>a</sup> Guillaume Penaranda, <sup>c</sup> Masatoshi Yamazaki, MD, PhD, <sup>c</sup> Uma Mahesh R. Avula, MD, <sup>c</sup> Laurence Curel, MS, <sup>a</sup> Sabrina Siame, <sup>a</sup> Omer Berenfeld, PhD, <sup>c</sup> André Pisapia, MD, <sup>a</sup> Jérôme Kalifa, MD, PhD, <sup>c</sup>

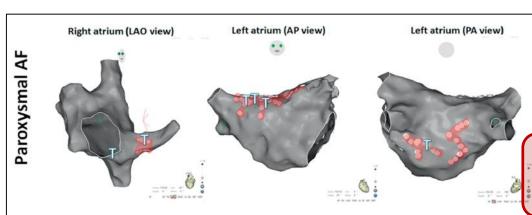
## **JACC 2017**

22, 8 % of paroxysmal AFIb

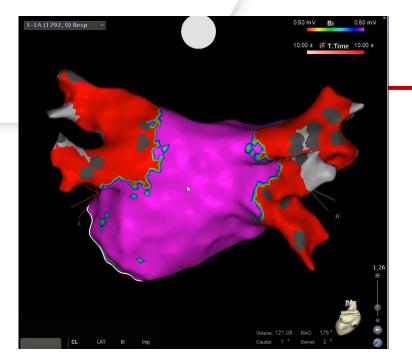
Ablation at dispersion areas terminated AF in 95% of the 105 patients

on average 1,4 +/- à 0,5 procedures 18 months of follow up

The atrial arrhythmia recurrence rate was 15%



| Dispersion areas  Total dispersion area surface, cm²  Mean ± SD  Median (IQR)  Mean ± SD  Mean ± SD  Mean ± SD  Mean ± SD  Median (IQR)  Mean (IQR)  Number of dispersion areas  Mean ± SD  Median (IQR)  Ablation in the RA  RA ablated surface, cm²  Mean ± SD  Median (IQR)  Ablation in the RA  RA total surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Median (IQR)  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Median (IQR)  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  157 ± 47  139 ±  Median (IQR)  Percent of LA ablated surface  | All Patients Paroxysmal       |
|---|-------------------------------|
| Total dispersion area surface, cm²  Mean ± SD  Median (IQR)  Mean dispersion area surface, cm²  Mean ± SD  Median (IQR)  Mean dispersion area surface, cm²  Mean ± SD  Median (IQR)  Number of dispersion areas  Mean ± SD  Median (IQR)  Ablation in the RA  RA ablated surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  157 ± 47  139 ±  Median (IQR)  Percent of LA ablated surface  | _                             |
| Mean ± SD       22.5 ± 13.5       18 ± 1         Median (IQR)       19 (12.5-33)       17 (13-3)         Mean ± SD       5 ± 2       5 ± 2         Median (IQR)       4.5 (3-6)       4.5 (3.4-6)         Number of dispersion areas       Mean ± SD       5 ± 1.5       4 ± 1.         Median (IQR)       5 (4-6)       4 (3-9)         Ablation in the RA       RA ablated surface, cm²       6 ± 5       4 ± 5         Median (IQR)       4.5 (2-7)       3 (0-4)         RA total surface, cm²       154 ± 58       138.3 ±         Median (IQR)       150 (122-184)       129 (121-184)         Percent of RA ablated surface       4 ± 2.5       3.8 ±         Ablation in the LA       LA ablated surface, cm²       25.5 ± 15.7       20.5 ± 15.7         Mean ± SD       25.5 ± 15.7       20.5 ± 15.7       20.5 ± 15.7         Mean ± SD       25.5 ± 15.7       20.5 ± 15.7       20.5 ± 15.7         Mean ± SD       157 ± 47       139 ± 15.7         Median (IQR)       156 (135-171)       153 (114-18)         Percent of LA ablated surface       156 (135-171)       153 (114-18)  |                               |
| Median (IQR)       19 (12.5-33)       17 (13-1)         Mean dispersion area surface, cm²       5 ± 2       5 ± 2         Median (IQR)       4.5 (3-6)       4.5 (3.4-1)         Number of dispersion areas       Mean ± SD       5 ± 1.5       4 ± 1.         Median (IQR)       5 (4-6)       4 (3-3-1)         Ablation in the RA       RA ablated surface, cm²       4 ± 5       4 ± 5         Median (IQR)       4.5 (2-7)       3 (0-4)       3 (0-4)         RA total surface, cm²       4 ± 58       138.3 ± 129 (121-1)       138.3 ± 129 (121-1)         Percent of RA ablated surface       Mean ± SD       4 ± 2.5       3.8 ± 129 (121-1)         Ablation in the LA       LA ablated surface, cm²       25.5 ± 15.7       20.5 ± 12 (121-1)         Mean ± SD       25.5 ± 15.7       20.5 ± 12 (121-1)       20.5 ± 12 (121-1)         Median (IQR)       20.6 (15-35.5)       19 (14-1)         LA total surface, cm²       157 ± 47       139 ± 13 | cm²                           |
| Mean dispersion area surface, cm²       5 ± 2       5 ± 2         Median (IQR)       4.5 (3-6)       4.5 (3.4-1)         Number of dispersion areas       Mean ± SD       5 ± 1.5       4 ± 1.5         Median (IQR)       5 (4-6)       4 (3-4)         Ablation in the RA       RA ablated surface, cm²       6 ± 5       4 ± 9.5         Median (IQR)       4.5 (2-7)       3 (0-4)         RA total surface, cm²       154 ± 58       138.3 ± 129 (121-124)         Median (IQR)       150 (122-184)       129 (121-124-124)         Percent of RA ablated surface       4 ± 2.5       3.8 ± 124-124         Ablation in the LA       LA ablated surface, cm²       25.5 ± 15.7       20.5 ± 124-124         Mean ± SD       25.5 ± 15.7       20.5 ± 124-124       20.5 ± 124-124         LA total surface, cm²       20.6 (15-35.5)       19 (14-124-124)         LA total surface, cm²       157 ± 47       139 ± 124-124         Median (IQR)       156 (135-171)       153 (114-124)         Percent of LA ablated surface       156 (135-171)       153 (114-124)   | $22.5 \pm 13.5$ $18 \pm 10$   |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 19 (12.5-33) 17 (13-22)       |
| Median (IQR)       4.5 (3-6)       4.5 (3.4-6)         Number of dispersion areas       Mean ± SD       5 ± 1.5       4 ± 1.5         Median (IQR)       5 (4-6)       4 (3-5)         Ablation in the RA       RA ablated surface, cm²       6 ± 5       4 ± 5.5         Median (IQR)       4.5 (2-7)       3 (0-4)         RA total surface, cm²       154 ± 58       138.3 ±         Median (IQR)       150 (122-184)       129 (121-184)         Percent of RA ablated surface       4 ± 2.5       3.8 ±         Ablation in the LA       LA ablated surface, cm²       4 ± 2.5       3.8 ±         Median (IQR)       20.6 (15-35.5)       19 (14-18)         LA total surface, cm²       157 ± 47       139 ± 18         Median (IQR)       156 (135-171)       153 (114-18)         Percent of LA ablated surface       156 (135-171)       153 (114-18)   | cm <sup>2</sup>               |
| Number of dispersion areas  Mean ± SD  Median (IOR)  Ablation in the RA  RA ablated surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  RA total surface, cm²  Mean ± SD  Median (IQR)  Percent of RA ablated surface  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Ablation in the LA  LA total surface, cm²  Mean ± SD  Ablation in the LA  LA ablated surface, cm²  Mean ± SD  Median (IQR)  157 ± 47  139 ±  Median (IQR)  Percent of LA ablated surface   | $5\pm2 \hspace{1cm} 5\pm2$    |
| Mean ± SD       5 ± 1.5       4 ± 1.5         Median (IOR)       5 (4-6)       4 (3-5)         Ablation in the RA       RA ablated surface, cm²         Mean ± SD       6 ± 5       4 ± 5         Median (IQR)       4.5 (2-7)       3 (0-4)         RA total surface, cm²       154 ± 58       138.3 ±         Median (IQR)       150 (122-184)       129 (121-121-121-122)         Percent of RA ablated surface       4 ± 2.5       3.8 ±         Ablation in the LA       LA ablated surface, cm²       25.5 ± 15.7       20.5 ± 15.7         Median (IQR)       20.6 (15-35.5)       19 (14-12-12)         LA total surface, cm²       157 ± 47       139 ± 15.7         Median (IQR)       156 (135-171)       153 (114-12-12)         Percent of LA ablated surface  | 4.5 (3-6) 4.5 (3.4-6.0)       |
| Median (IOR)       5 (4-6)       4 (3-5)         Ablation in the RA       RA ablated surface, cm²         Mean ± SD       6 ± 5       4 ± 5         Median (IQR)       4.5 (2-7)       3 (0-4)         RA total surface, cm²       154 ± 58       138.3 ±         Median (IQR)       150 (122-184)       129 (121-194)         Percent of RA ablated surface       4 ± 2.5       3.8 ±         Ablation in the LA       LA ablated surface, cm²       25.5 ± 15.7       20.5 ± 15.7         Median (IQR)       20.6 (15-35.5)       19 (14-194.2)         LA total surface, cm²       157 ± 47       139 ± 157.2         Median (IQR)       156 (135-171)       153 (114-194.2)         Percent of LA ablated surface       156 (135-171)       153 (114-194.2)   |                               |
| Ablation in the RA RA ablated surface, cm² Mean $\pm$ SD Median (IQR) RA total surface, cm² Mean $\pm$ SD Median (IQR) RA total surface, cm² Mean $\pm$ SD Median (IQR) Percent of RA ablated surface Mean $\pm$ SD Ablation in the LA LA ablated surface, cm² Median (IQR) LA total surface, cm² Median (IQR)  LA total surface, cm² Mean $\pm$ SD  Median (IQR)  LA total surface, cm² Mean $\pm$ SD Median (IQR)  Median (IQR)  Median (IQR)  Median (IQR)  Median (IQR)  156 (135-171)  153 (114-181)  Percent of LA ablated surface  | $5 \pm 1.5$ $4 \pm 1.7$       |
| RA ablated surface, cm <sup>2</sup> Mean $\pm$ SD  6 $\pm$ 5  4 $\pm$ 5  Median (IQR)  4.5 (2-7)  3 (0-4)  RA total surface, cm <sup>2</sup> Mean $\pm$ SD  154 $\pm$ 58  138.3 $\pm$ Median (IQR)  Percent of RA ablated surface  Mean $\pm$ SD  4 $\pm$ 2.5  3.8 $\pm$ Ablation in the LA  LA ablated surface, cm <sup>2</sup> Mean $\pm$ SD  25.5 $\pm$ 15.7  20.5 $\pm$ 5  Median (IQR)  20.6 (15-35.5)  19 (14-14)  LA total surface, cm <sup>2</sup> Mean $\pm$ SD  157 $\pm$ 47  139 $\pm$ 6  Median (IQR)  Percent of LA ablated surface  | 5 (4-6) 4 (3-5)               |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |                               |
| Median (IQR) $4.5 (2-7)$ $3 (0-4)$ RA total surface, cm² $154 \pm 58$ $138.3 \pm 10$ Median (IQR) $150 (122-184)$ $129 (121-12)$ Percent of RA ablated surface $4 \pm 2.5$ $3.8 \pm 10$ Ablation in the LA $4 \pm 2.5$ $4 \pm 2.5$ $4 \pm 2.5$ Mean $\pm 50$ $4 \pm 2.5$ $4 \pm 2.5$ $4 \pm 2.5$ $4 \pm 2.5$ Mean $\pm 50$ $4 \pm 2.5$ $4 \pm 2$  |                               |
| RA total surface, cm <sup>2</sup> Mean $\pm$ SD  Median (IQR)  Percent of RA ablated surface  Mean $\pm$ SD  Ablation in the LA  LA ablated surface, cm <sup>2</sup> Median (IQR)  25.5 $\pm$ 15.7  Median (IQR)  Median (IQR)  Ablated surface, cm <sup>2</sup> Mean $\pm$ SD  Ablation in the LA  LA ablated surface, cm <sup>2</sup> Median (IQR)  Ablated Surface, cm <sup>2</sup> Median (IQR)  Mean $\pm$ SD  Median (IQR)  157 $\pm$ 47  139 $\pm$ Median (IQR)  Percent of LA ablated surface   | $6\pm 5$ $4\pm 5$             |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 4.5 (2-7) 3 (0-4)             |
| Median (IQR)       150 (122-184)       129 (121-121-121-121-121-121-121-121-121-121   |                               |
| Percent of RA ablated surface Mean $\pm$ SD 4 $\pm$ 2.5 3.8 $\pm$ Ablation in the LA LA ablated surface, cm <sup>2</sup> Mean $\pm$ SD 25.5 $\pm$ 15.7 20.5 $\pm$ 1 Median (IQR) 20.6 (15-35.5) 19 (14-LA total surface, cm <sup>2</sup> Mean $\pm$ SD 157 $\pm$ 47 139 $\pm$ Median (IQR) 156 (135-171) 153 (114-Percent of LA ablated surface   | $154 \pm 58$ $138.3 \pm 71.0$ |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 150 (122-184) 129 (121-186)   |
| Ablation in the LA LA ablated surface, cm <sup>2</sup> Mean $\pm$ SD 25.5 $\pm$ 15.7 20.5 $\pm$ Median (IQR) 20.6 (15-35.5) 19 (14-LA total surface, cm <sup>2</sup> Mean $\pm$ SD 157 $\pm$ 47 139 $\pm$ Median (IQR) 156 (135-171) 153 (114-Percent of LA ablated surface   |                               |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | $4 \pm 2.5$ $3.8 \pm 3$       |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |                               |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |                               |
| LA total surface, cm <sup>2</sup> Mean ± SD  157 ± 47  139 ±  Median (IQR)  156 (135–171)  153 (114–  Percent of LA ablated surface   | 25.5 ± 15.7 20.5 ± 10.5       |
| Mean ± SD       157 ± 47       139 ± 47         Median (IQR)       156 (135-171)       153 (114-174)         Percent of LA ablated surface  | 20.6 (15-35.5) 19 (14-27)     |
| Median (IQR) 156 (135-171) 153 (114-<br>Percent of LA ablated surface   |                               |
| Percent of LA ablated surface   | 157 ± 47 139 ± 44             |
|   | 156 (135-171) 153 (114-164)   |
| Mean ± SD 17 ± 10 15.8 ±  |                               |
|   | 17 ± 10 15.8 ± 8.8            |
| Ablation in both atria  |                               |
| Biatrial total surface, cm <sup>2</sup>   |                               |
| Mean ± SD 302 ± 85 266 ± 9  | $302 \pm 85$ $266 \pm 97.5$   |
| Median (IQR) 312 (257-350) 288 (207   | 312 (257-350) 288 (207-331)   |
| Bi-atrial total ablated surface, cm²  | cm²                           |
| Mean ± SD 31 ± 19 25 ±  | $31 \pm 19$ $25 \pm 12$       |
| Median (IQR) 24.5 (18-39.5) 21 (17-3  | 24.5 (18-39.5) 21 (17-39)     |
| Percent of biatrial ablated surface, cm <sup>2</sup>  |                               |
| Mean ± SD 10 ± 5 10 ±   | 10 ± 5 10 ± 4                 |



# For the REDO procedure

Currently with new technologies
Only 10-20% of reconnected PV in REDO procedure

What do we offer to these patients?

The radiofrequency proves to be of great importance in this management

## Cost effectiveness

ORIGINAL ARTICLE

Cost comparison of radiofrequency catheter ablation versus cryoablation for atrial fibrillation in hospitals using both technologies

Tina D. Hunter<sup>a</sup>, Swetha R. Palli<sup>a</sup> and John A. Rizzo<sup>b</sup>

Journal of Medical Economics 2016

**Conclusion:** AF ablation using RF results in significantly lower costs compared with Cryo, despite an RF population with more cardiovascular disease. This saving cannot be attributed to a difference in complication rates.



# **Take Home Message**







www.clinique-pasteur.com

For trained teams, Ablation with the last technology of RF or cryo are equally effective for the deconnection of PV

No difference in terms of complication or RX exposure

Longer learning curve, but less expensive procedure

Interest of RF energy in tailored and individualized management of "all paroxysmal AF"

Interest of RF over the Cryo in REDO procedures





Thank you for your attention

www.clinique-pasteur.com