

PLACE

PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

ROMA

Centro Congressi
di Confindustria

**Auditorium
della Tecnica**

9^a Edizione

30 Settembre

1 Ottobre

2022



LUNCHEON PANEL ABLAZIONE MRI GUIDED

E' POSSIBILE ESEGUIRE ABLAZIONI CON UN SISTEMA DI NAVIGAZIONE «REAL TIME - MRI GUIDED». QUALI INFORMAZIONI OTTENIAMO?

Alessio Borrelli

Laboratorio di Elettrofisiologia & Elettrostimolazione – Policlinico Casilino (Roma)



Is it possible to perform MRI - Guided Ablation in Human?

Yes

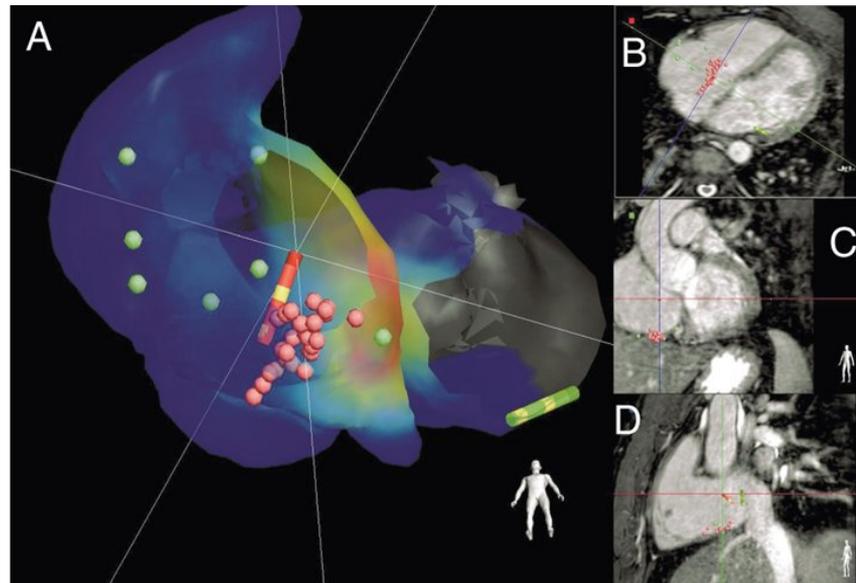




Figure 4 Activation map of the right atrium in LAO from inferior. The isthmus line as depicted by the ablation tags ...

Real-time magnetic resonance-guided ablation of typical right atrial flutter using a combination of active catheter tracking and passive catheter visualization in man: initial results from a consecutive patient series

Sebastian Hilbert, Philipp Sommer, Matthias Gutberlet, Thomas Gaspar, Borek Foldyna, Christopher Piorkowski, Steffen Weiss, Thomas Lloyd, Bernhard Schnackenburg, Sascha Krueger



**TABLE 1** Selected Real-Time CMR-Guided Experimental and Clinical Studies

| | Subjects | Ablation Site | Magnetic Resonance Imaging Scanner | Catheter Tracking |
|-------------------------------------|-----------|--------------------------------|------------------------------------|--------------------|
| Experimental/animal studies | | | | |
| Lardo et al. 2000 ⁵⁶ | 6 canine | RV | 1.5-T GE | Passive |
| Schmidt et al. 2009 ³⁷ | 8 swine | PV, AV node | 1.5-T GE | Active |
| Nordbeck et al. 2009 ³⁷ | 8 swine | RV or AV node | 1.5-T Siemens, Philips | Passive |
| Hoffmann et al. 2010 ⁵⁸ | 20 swine | CTI | 1.5-T Siemens | Passive |
| Nordbeck et al. 2011 ⁵⁹ | 9 swine | RA, RV, septum or CS | 1.5-T | Passive |
| Vergara et al. 2011 ⁶⁰ | 6 swine | LA, RA | 3.0-T Siemens | Active |
| Ranjan et al. 2011 ⁵¹ | 12 swine | RA gaps | 3.0-T Siemens | Active |
| Ganesan et al. 2012 ⁵² | 11 sheep | PV, CTI | 1.5-T Siemens | Passive |
| Grothoff et al. 2017 ²⁷ | 14 swine | RA/LA lesions, AV node | 1.5-T Philips | Active |
| Krahn et al. 2018 ⁴⁷ | 12 swine | LV lesions (retrograde access) | 1.5-T GE | Active |
| Mukherjee et al. 2018 ³³ | 6 swine | epicardial lesions | 1.5-T Siemens | Active |
| Lichter et al. 2019 ³⁹ | 5 canine | PVI, superior vena cava, focal | 3.0-T Siemens | Passive |
| Clinical studies | | | | |
| Nordbeck et al. 2014 ⁶³ | 1 human | CTI | 1.5-T Siemens | Passive |
| Piorowski et al. 2013 ²⁵ | 1 human | CTI | 1.5-T Philips | Passive |
| Hilbert et al. 2016 ⁶⁴ | 6 humans | CTI | 1.5-T Philips | Active |
| Chubb et al. 2017 ²⁶ | 10 humans | CTI | 1.5-T Philips | Active |
| Paetsch et al. 2019 ³⁸ | 30 humans | CTI | 1.5-T Philips | Active and passive |

AV = atrioventricular; CTI = cavotricuspid isthmus; CS = coronary sinus; LA = left atrium; LV = left ventricle; PV = pulmonary vein; PVI = pulmonary vein isolation; RA = right atrium; RV = right ventricle.

Mainly CTI procedures



Do We want to perform MRI guided Ablation?

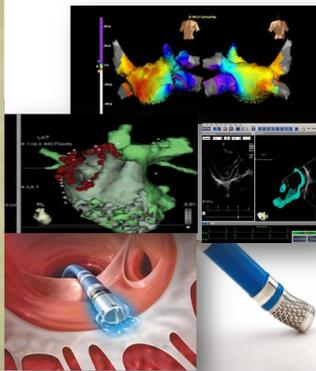
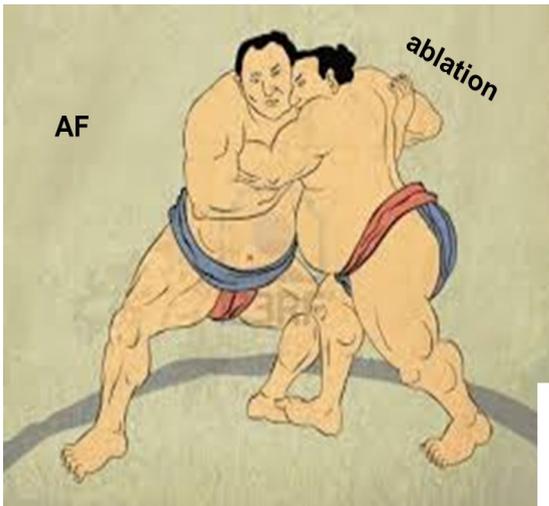




Worldwide survey

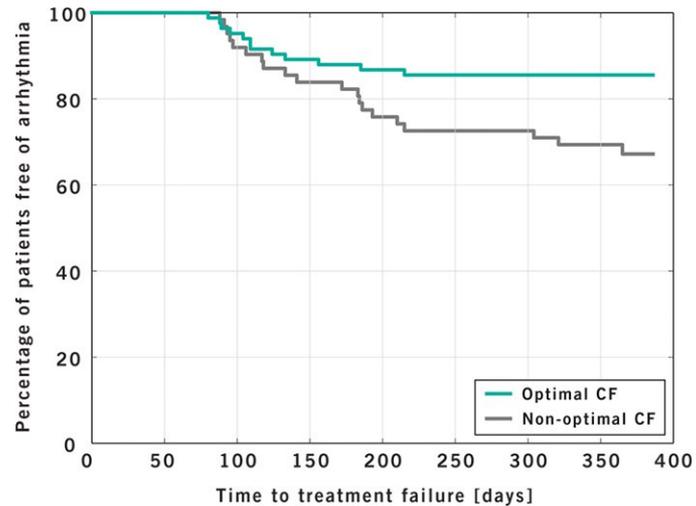
Success Rate 75% - 2010 (45-84%)

Success Rate 75% - 2015 (71-84%)

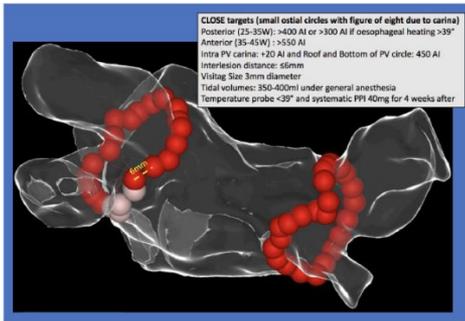


Nessuna differenza ad 1 anno tra One Shot e point by point

Optimal CF² vs. Non-optimal CF³ Clinically Relevant Success at 12 months



CLOSE



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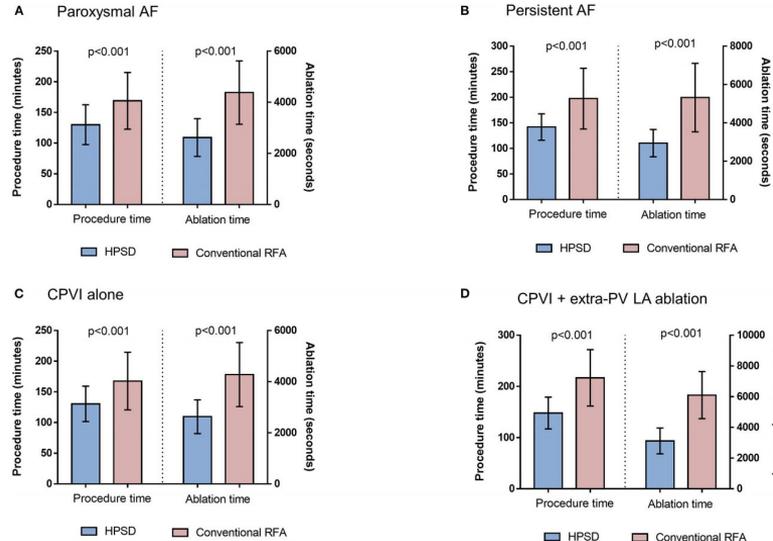


FIGURE 4 | The comparisons of procedure time and ablation time between HPSD and conventional power groups in the patients with paroxysmal AF (A), persistent AF (B), circumferential pulmonary vein isolation (CPVI) alone (C), or additional extra-pulmonary vein (PV) left atrial (LA) ablation (D). HPSD, high-power short-duration radiofrequency ablation; AF, atrial fibrillation; RFA, radiofrequency ablation.

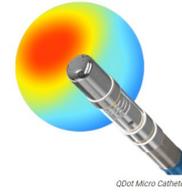
High Power Short Duration

Present Energy Source

Future Lesion Assessment and source

Q-FFICIENCY trial shows promise for temperature-controlled ablation

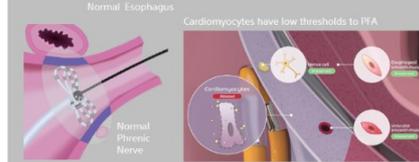
1st February 2022 ● 5109



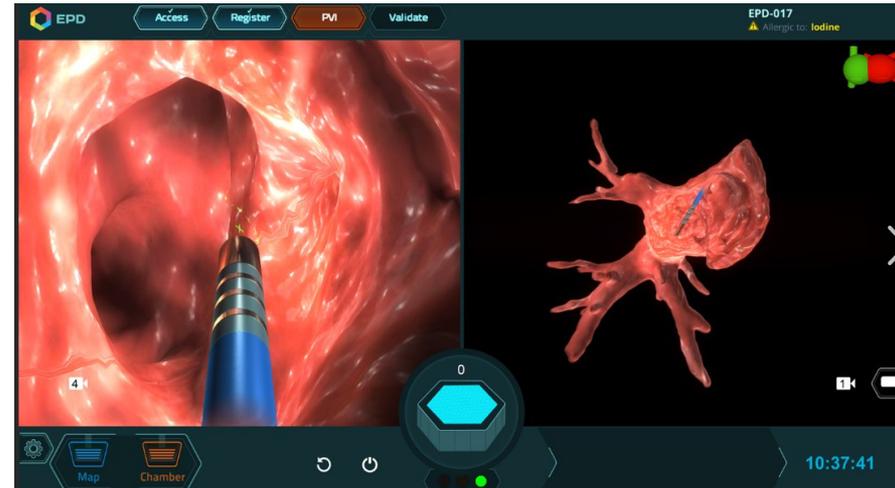
QDot Micro Catheter

Use of temperature-controlled ablation for the treatment of atrial fibrillation (AF) is effective and highly efficient, according to Jose Osorio—the director of electrophysiology at Grandview Medical Center in Birmingham, Alabama, USA. His comments follow the completion of a US-based clinical trial, evaluating the safety and efficacy of a new ablation catheter, the QDot Micro Catheter (Biosense Webster), which he presented at AF symposium 2022 (13–15 January, New York City, USA) earlier this year. Here he tells *Cardiac Rhythm News* about the findings of the Q-FFICIENCY trial and recent technological advancements in ablation technology.

PULSED FIELD ABLATION



Other tissue/cell types are more resistant to PFA & remained uninjured despite exposure to the field



Effectiveness of Radiofrequency Catheter Ablation of Outflow Tract Ventricular Arrhythmias in Children and Adolescents

Xiao-Mei Li^{1,2} · He Jiang^{1,2} · Yan-Hui Li^{1,2} · Yan Zhang^{1,2} · Hai-Ju Liu^{1,2} · Hai-Yan Ge^{1,2} · Yi Zhang^{1,2} · Mei-Ting Li^{1,2}

Abstract Outflow tract ventricular arrhythmias (OTVAs) are common in children; however, experience is limited on their radiofrequency catheter ablation (RFCA). The purpose of this study was to assess the outcomes of mapping and ablation of pediatric OTVAs and to evaluate the role of ECG algorithms in distinguishing the origin of OTVAs. We compared retrospectively collected single-center data on 92 consecutive pediatric patients (58 male; age, 8.2 ± 2.9 [range 3.6–18] years) who underwent RFCA for OTVAs from 2009 to 2015. Two independent and blinded observers analyzed ECG data. Of these children, 69 (75 %) were of RVOT origin. RFCA was given up in 1 case, and the acute success rate was 92.3 % (84/91), the 1-year follow-up recurrence rate was 8.3 % (7/84) and the complications of the procedure were 2.2 % (2/92). And 3D versus 2D mapping-guided RFCA was associated with significantly ($p < 0.05$) higher acute success rate (96.1 % [49/51] vs. 87.5 % [35/40]), and lower X-ray exposure (742.5 ± 323.1 vs. 1432.3 ± 605.5 mGy cm^2) and 1-year recurrence rate (4.1 % [2/49] vs. 14.3 % [5/35]). The positive predictive value of four types of ECG algorithms used in adults for LVOT origin was only 47.7–65.4 %. In these cases, four identified as RVOT origin and two identified as LVOT origin by ECG underwent successful ablation on the other side of outflow tract finally. And these

six children who underwent successful RFCA in both sides of outflow tract had no follow-up recurrence. OTVAs in children originate mostly from RVOT. RFCA can be used for ablation of pediatric OTVAs effectively and safely. In some cases, successful RFCA should be ablated in both sides of outflow tract. ECG-based prediction of OTVA origin as used in adults is limited in children.

Keywords Outflow tract · Pediatric · Radiofrequency catheter ablation · Ventricular arrhythmia

Abbreviations

| | |
|------|--------------------------------------|
| LVOT | Left ventricular outflow tract |
| OTVA | Outflow tract ventricular arrhythmia |
| PVC | Premature ventricular contraction |
| RFCA | Radiofrequency catheter ablation |
| RVOT | Right ventricular outflow tract |
| VT | Ventricular tachycardia |

Introduction

Idiopathic premature ventricular contractions (PVCs) or ventricular tachycardia (VT) most frequently originates from right and left ventricular outflow tracts (RVOT and

Aortic Valve Rupture Due to Radiofrequency Ablation of Left Ventricular Outflow Tract Extrasystole

ZSUZSANNA KIS, M.D., MATYAS PAL, M.D., ZOLTAN SZABO, M.D., and ATTILA KARDOS, M.D., Ph.D.

From the Gottsegen Gyorgy National Institute of Cardiology, Budapest, Hungary

aortic valve damage, catheter ablation, complication, premature ventricular complexes

A 72-year-old man with left ventricle outflow tract extrasystole was admitted for a radiofrequency catheter ablation (RFCA) procedure. Transthoracic echocardiographic examination showed moderately decreased global systolic left ventricle function. The three-leaflet aortic valve function was normal. Coronary angiography examination detected mild coronary artery disease. The frequent monotypic PVCs were (30% on the 24-hour Holter) thought to be the cause by systolic dysfunction of the left ventricle. Therefore, an electrophysiology study and RFCA were indicated. Prior to the procedure informed consent was obtained. The CARTO electroanatomical navigation system and a Navistar F curve contact force (CF) sensing catheter were used for mapping the outflow tract region. The earliest activation site of the PVC was mapped transeptally at the basal-anterior left ventricular wall, under the left coronary cusp. Afterward, it was eliminated successfully (30 W, 10 g using an irrigated tip 4 mm ablation catheter). The following day severe dyspnea and a new onset cardiac murmur were found. The transesophageal echocardiography examination revealed that the left aortic valve leaflet was ruptured causing severe aortic valve insufficiency (Fig. 1). Due to the symptomatic acute severe aortic valve insufficiency the patient underwent emergency aortic valve surgery. During the operation a 5–7 mm rupture could be seen on the left leaflet and non-coronary commissure of the aortic valve (Fig. 2). Resuspension and commissuroplasty of the ruptured leaflet were performed with good result. This is the first aortic valve injury reported when using a CF sensing ablation catheter. It seems unlikely that radiofrequency caused the rupture but

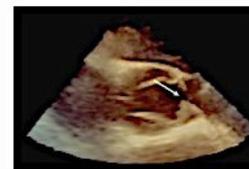


Figure 1. The three-dimensional transesophageal echocardiography examination showing the rupture of the left leaflet of the aortic valve. For a high quality, full color version of this figure, please see *Journal of Cardiovascular Electrophysiology's* website: www.wileyonlinelibrary.com/journal/jce

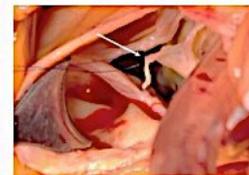


Figure 2. Intraoperative photo during the commissuroplasty of the ruptured leaflet of the aortic valve. For a high quality, full color version of this figure, please see *Journal of Cardiovascular Electrophysiology's* website: www.wileyonlinelibrary.com/journal/jce

it was due to the compression and distension of the catheter maneuvers to reach the suitable position. The relatively rigid distal part of the contact force sensing catheter's shaft could explain the aortic valve injury when U-shaped deflection was used in the ascending aorta to cross the aortic valve.

Acknowledgment: We thank Dr. Andras Csépegi for his valuable contribution to the paper.

J Cardiovasc Electrophysiol, Vol. 27, p. 992, August 2016.

Disclosures: None.

Address for correspondence: Attila Kardos, M.D., Ph.D., Department of Cardiac Electrophysiology, Gottsegen Gyorgy National Institute of Cardiology, Haller u. 29, Budapest, 1094, Hungary. Fax: 36-1-215-5593; E-mail: drkardosattila@gmail.com

Manuscript received 7 February 2016; Accepted for publication 15 February 2016.

doi: 10.1111/jce.12959

the acute success rate was 92.3 % (84/91), the 1-year follow-up recurrence rate was 8.3 % (7/84) and the complications of the procedure were 2.2 % (2/92).



Randomized Controlled Trial J Cardiovasc Electrophysiol

. 2021 Apr;32(4):916-924. doi: 10.1111/jce.14957. Epub 2021 Mar 2.

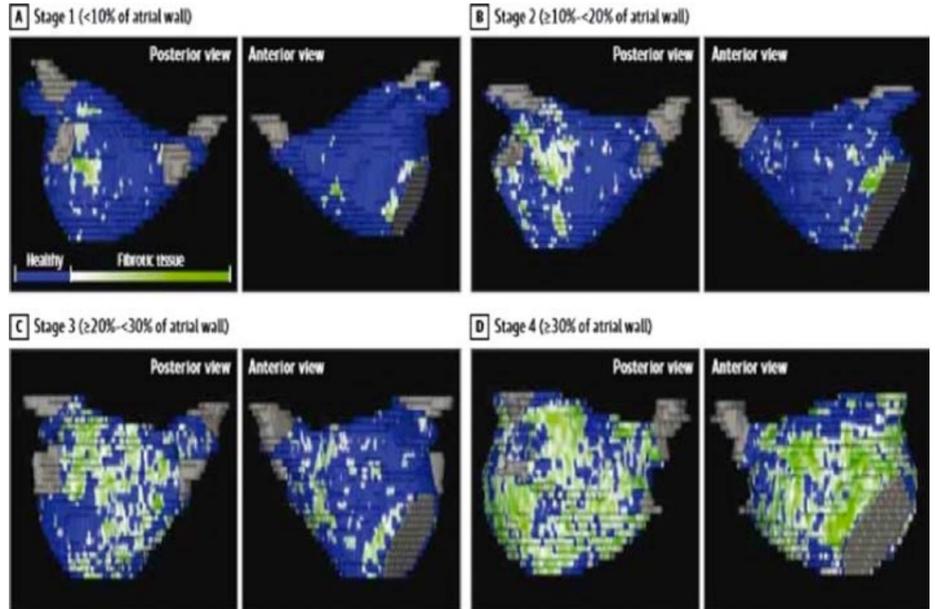
Efficacy of LGE-MRI-guided fibrosis ablation versus conventional catheter ablation of atrial fibrillation: The DECAAF II trial: Study design

Nassif F Marrouche 1, Tom Greene 2, J Michael Dean 2, Eugene G Kholmovski 2, Leonie Morrison-de Boer 2, Moussa Mansour 3, Hugh Calkins 4, Francis Marchlinski 5, David Wilber 6, Gerhard Hindricks 7, Christian Mahnkopf 8, Pierre Jais 9, Prashanthan Sanders 10, Johannes Brachmann 8, Jereon Bax 11, Lilas Dagher 1, Oussama Wazni 12, Nazem Akoum 13, DECAAF II Investigators

Affiliations expand

PMID: 33600025 DOI: 10.1111/jce.14957

If it was the substrate the responsible
of low success





Advantage

HD multipolar signals

Touched points reachable with the catheter

Real time visualization

Contact force and orientation of the catheter

Low to near zero X-Ray

Image integration

Limits

Multiple vasculare access with expensive procedure

We can reconstruct only with we get in contact with, other wise many virtual areas

Suboptimal gating or map shiftif patient move

Zeroing of contact force, not always optimal

May take Long time

Not always all sites reconstructable





KEY POINTS for a Successful EP Procedure



Substrate mapping



EGMs

Anatomy

Influencing factors

Anatomy

Mapping System

Team experience

Tissue thickness

Lesion assessment

M.o. Should be reproduceable and safe

What Information do we get?



Settembre 2022 Centro Congressi di Confindustria Auditorium della Tecnica

9ª Edizione



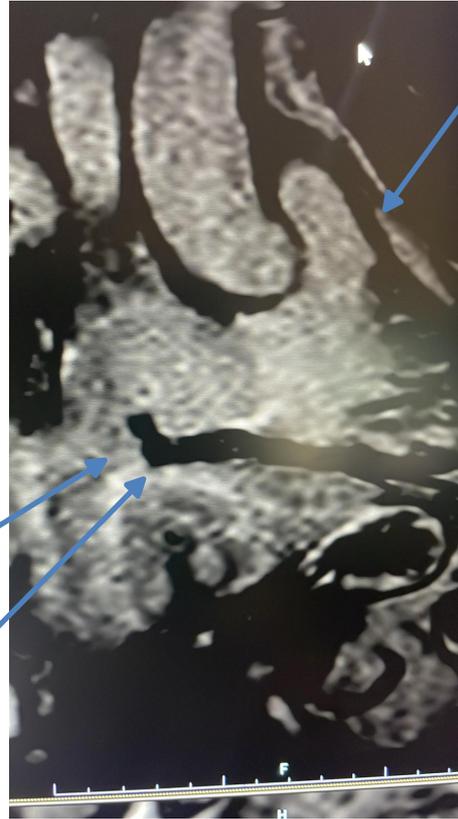
Substrate
Antomy
Signals



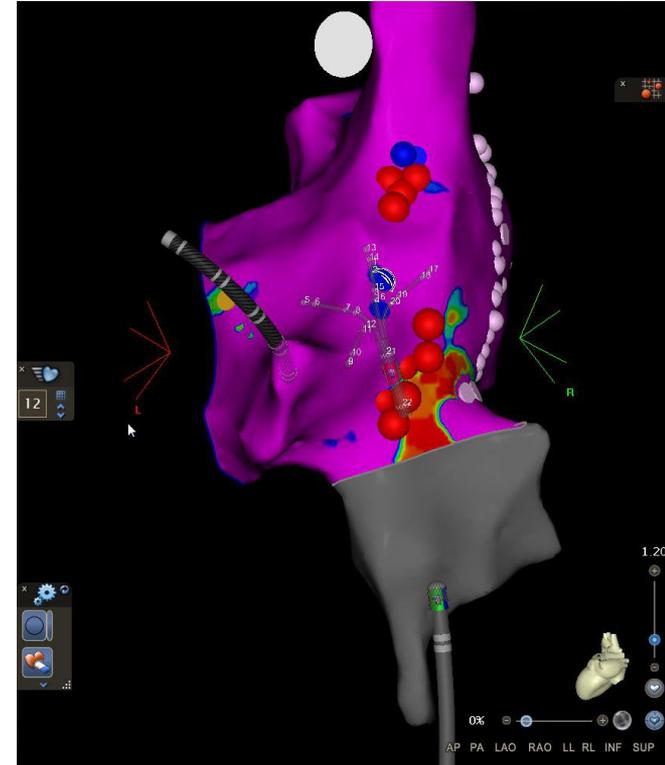
What Information do we get?

Anatomy ICT
how would appear in a normal Mapping system

ICT
Pouch



RVOT

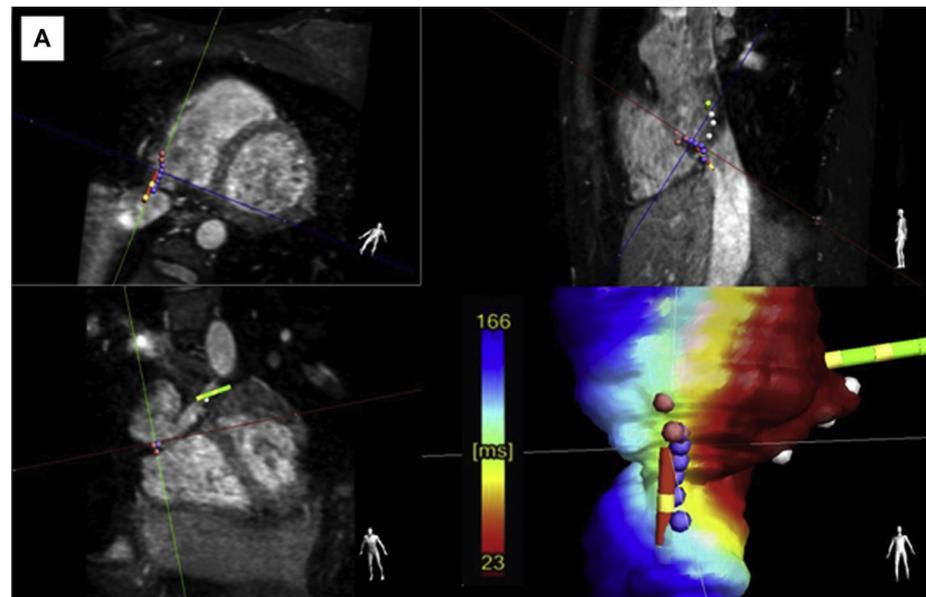




What Information do we get?

Additional Features

Activation map



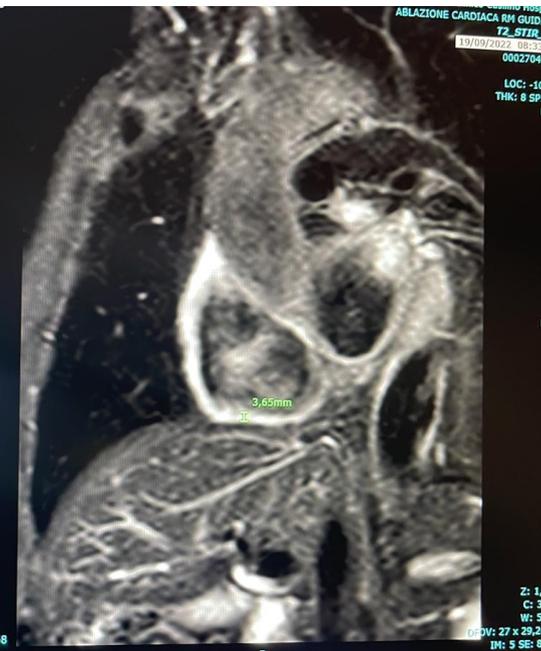
JACC: CLINICAL ELECTROPHYSIOLOGY VOL. 8, NO. 2, 2022
Bastian Klemens Bauer et al.



POST

PRE

LESION OR EDEMA
AFTER Ablation - End of
the procedure





Casilino Experience

Starting Date 28 Luglio 2022
First AFL MRI guided ablation in Italy
Good Example of **CARDIO RADIO TEAM**
WORKING



Left to right
Dr A. Borrelli
Dr M. Stefanini
Dr E. De Ruvo
Under
Dr A Ferrazza
S Bonetti

Thanks



Prof L. Calo'



Prof G. Simonetti



3 Atrial Flutter

2 PTS SR – 1 pt AF > CVE pre procedure

1 Procedure getting together and organizing EP room
almost 120 min

2 Procedure 100 min

3 Procedure 90 min

Skin To Skin Time

1° 120 min

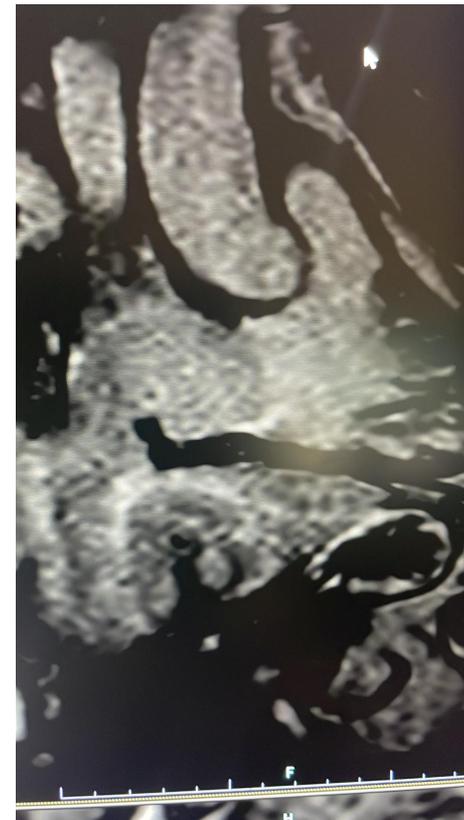
4 RF Pulse

2° 90 min Skin to Skin

7 RF Pulse

3° 50 min

5 RF Pulse





Some Issue

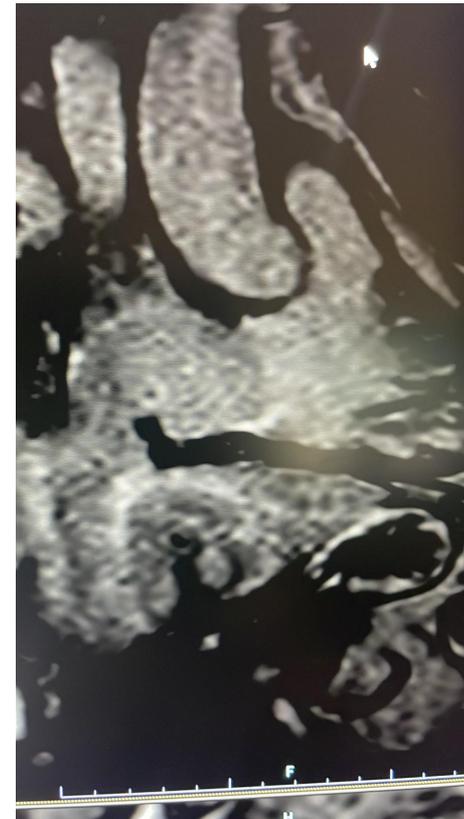
Headphones – Interaction necessary

Understanding different projection – RAO – LAO > Long
and Short Axis

Differentiating Catheters and proxymal and distal coil

Working on images and settings

BIG Team Work necessary





Others Experiences

Cardiovascular Magnetic Resonance-Guided Radiofrequency Ablation

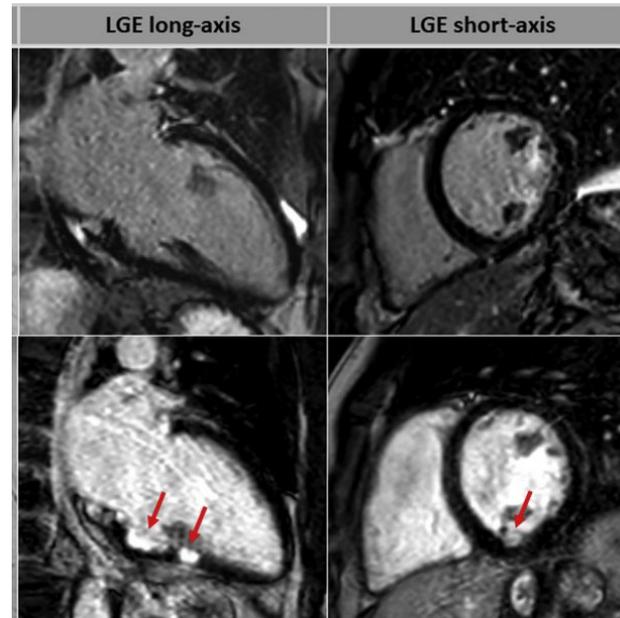


Where Are We Now?

Bastian Klemens Bauer, MD,^{a,*} Claudia Meier, MD,^{b,*} Michael Bietenbeck, PhD,^b Philipp Sebastian Lange, MD,^a
Lars Eckardt, MD,^{a,†} Ali Yilmaz, MD^{b,†}

JACC: CLINICAL ELECTROPHYSIOLOGY VOL. 8, NO. 2, 2022

Already left sided procedure



Waiting for Godot?

What's up next for MRI Procedures

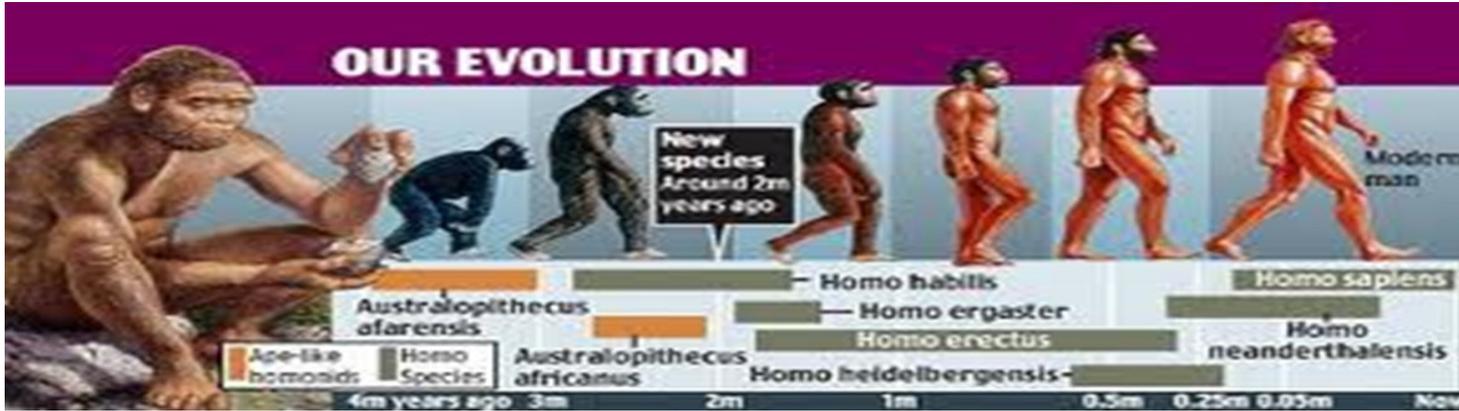
- High density mapping
- External Defibrillator for MRI Procedure
- MRI for Transeptal or Retrograde transaortic
- Real time Electroanatomical Mapping

Just Coming:

Ischemic TV mapping and ablation
lesion assesment and contact force
Left Atrium access and AF ablation



Cost Effectivness?



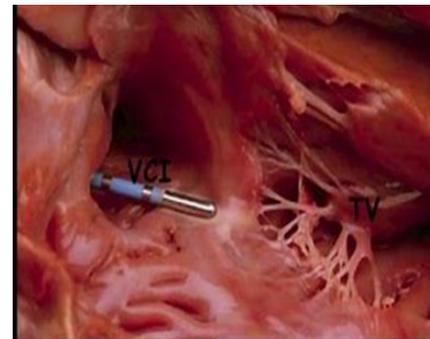
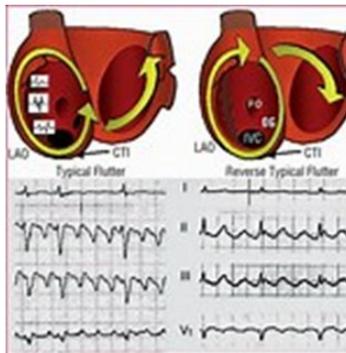
Evolution is very slow , but Happen
If Monkey was the apex of Evolution there would have not been any need
of getting Ahead.





Procedure MRI in EP

- Attualmente la metodica permette di eseguire solo procedure semplici nelle quali verosimilmente il mappaggio 3 D non è strettamente necessario. In Europa pochi Centri hanno eseguito procedure di ablazione MRI.
- Nelle prime serie sono state eseguite ablazioni di flutter atriali in atrio destro con ottimi risultati. Naturalmente essendo le prime si stanno ancora eseguendo speculazioni su quali parametri utilizzare, come evidenziare la lesione.
- L'utilizzo del Software I-SUITE con l'active tracking risulta essere davvero utile.



| Vantaggi | Limiti |
|--|---|
| Ricostruzione 3 D real time di tutte le aree | Mappe time consuming |
| Informazioni sul tessuto | Non disponibili informazioni sul contatto |
| Nessuna esposizione di Raggi X | Limitata disponibilità di materiali compreso defibrillatore esterno |
| Visualizzazione della lesione real time | Dopo il gadolinio tempo di attesa per rivalutazione DE |
| Visualizzazione di strutture extracardiache sensibili | Costi elevati |
| Vantaggio in anatomie difficili e strutture non visualizzabili con elettrocateri | Personale altamente specializzato |

- 13.30 - 14.45
- Moderatori: E. De Ruvo, Roma - G. Simonetti, Roma
- Introduzione: il futuro è adesso
- L. Calò, Roma
- Il laboratorio di radiologia interventistica
- M. Stefanini, Roma
- Lecture
- Future perspective of MRI in cardiology and EP
- I. van Der Bilt - V.J van Driel, Den Haag - Paesi Bassi
- È possibile eseguire ablazioni con un sistema di navigazione MRI guidato in tempo reale? Che informazioni otteniamo?
- A. Borrelli, Roma
- Casi clinici
- I. van Der Bilt, Den Haag - Paesi Bassi
- V.J van Driel, Den Haag - Paesi Bassi
- Quali informazioni possiamo ottenere dalla risonanza magnetica oggi e quali vorremmo ottenere. Siamo vicini alla determinazione della fibrosi di tutte le strutture cardiache?
- A. Fusco, Roma
- How to build an MRI EP Lab
- I. van Der Bilt, Den Haag - Paesi Bassi