Can VT Ablation Prevent Sudden Cardiac Death?

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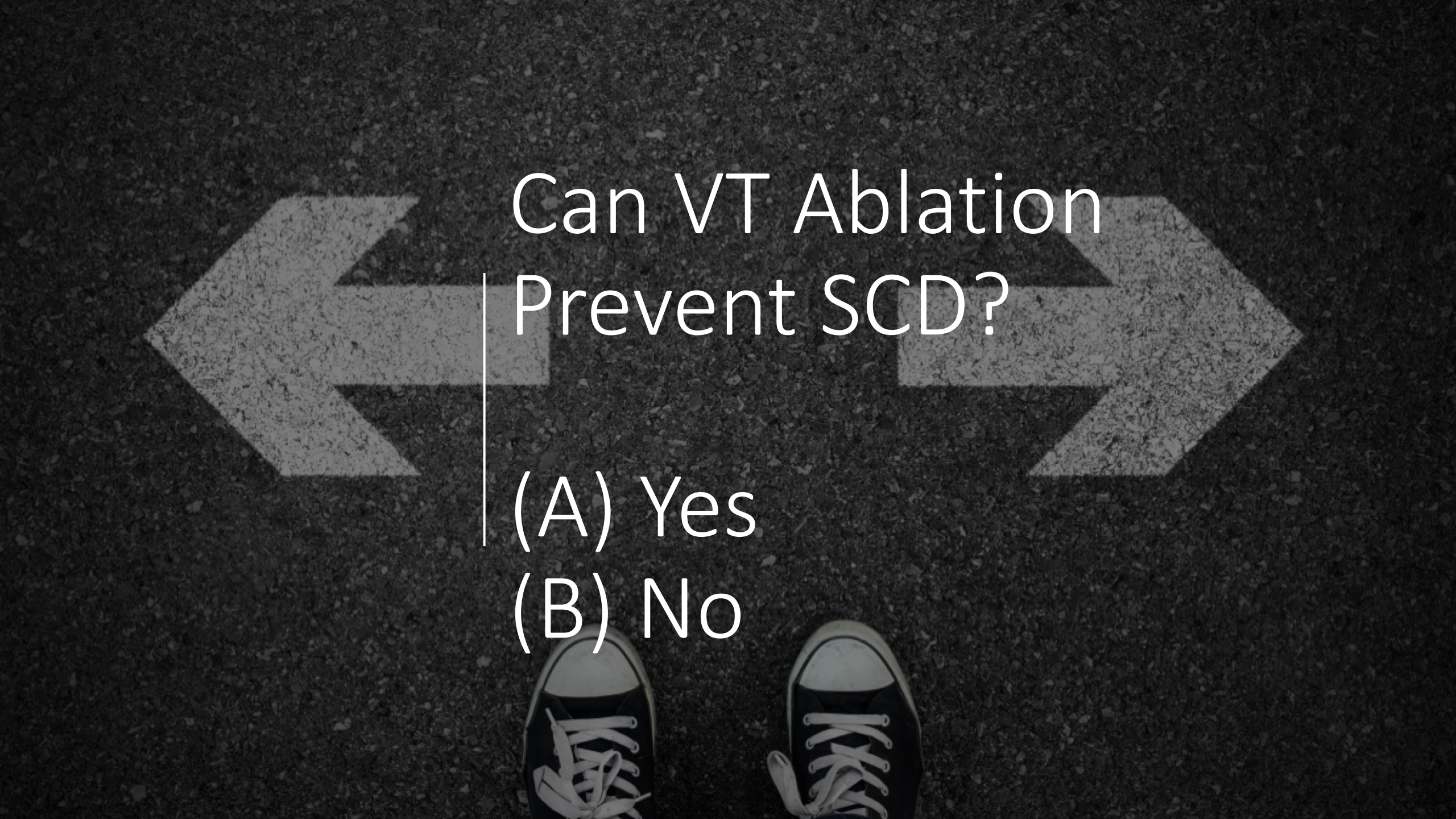
HERZZENTRUM LEIPZIG

CARDIO SUMMIT

Disclosures:

NONE



Can VT Ablation Prevent SCD?

(A) Yes
(B) No

Overview:

Can VT Ablation Prevent Sudden Cardiac Death?

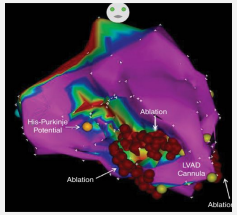
Current Data and Studies

My Vision: VT Ablation for Prevention of SCD

Download at https://www.arasharya.de/presentations/

If we want to prevent SCD:

- Optimal Medical Therapy
- 

Risk Factor(s) Management
- Better Event Prediction and Risk Assessment
- 

Better VT Ablation Techniques and/or Energy Sources

ESC European Society of Cardiology

European Heart Journal (2019) **40**, 2940–2949
doi:10.1093/eurheartj/ehz260

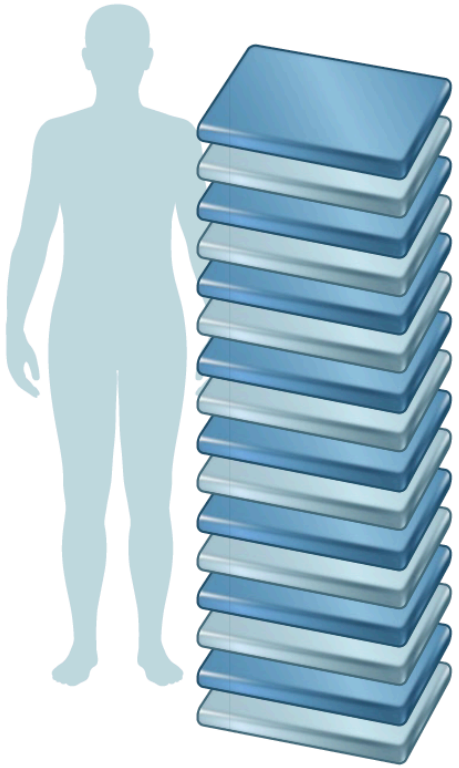
CLINICAL RESEARCH
Arrhythmia/electrophysiology

Arrhythmic risk stratification in post-myocardial infarction patients with preserved ejection fraction: the PRESERVE EF study

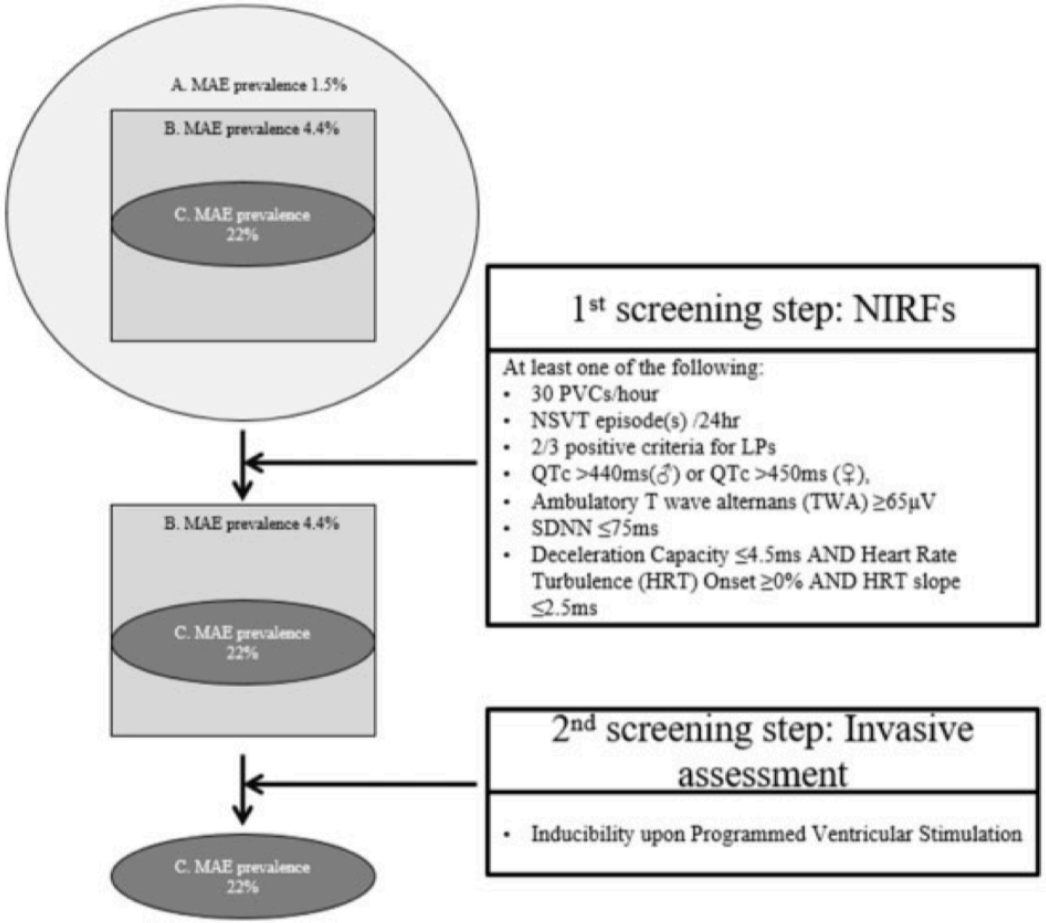
The authors screened and included 575 consecutive patients (mean age 57 years, LVEF 50.8%) with LVEF≥40%.

The two-step approach of the PRESERVE EF study detects a subpopulation of post-MI patients with preserved LVEF at risk for MAEs that can be effectively addressed with an ICD.

FU: 32 Months, No SCD. 9/37 (24.3%) patients with ICD received appropriate therapy for VT.

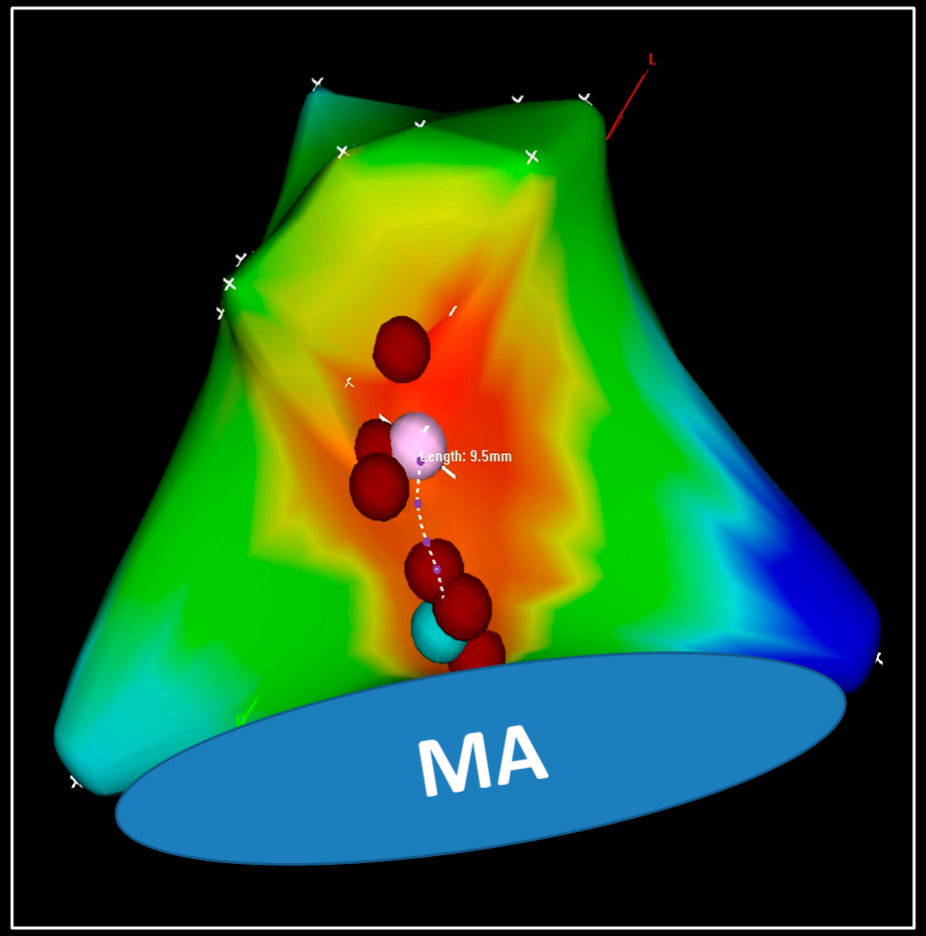


Inputs
Social, behavioral
Genomics and -omic layers
Biosensors
Immune system
Gut microbiome
Anatome
Environmental
Physical activity, sleep, nutrition
Medication, alcohol, drugs
Labs, plasma DNA, RNA
Family history
Communication, speech
Cognition, state of mind
All medical history
World's medical literature, continually updated



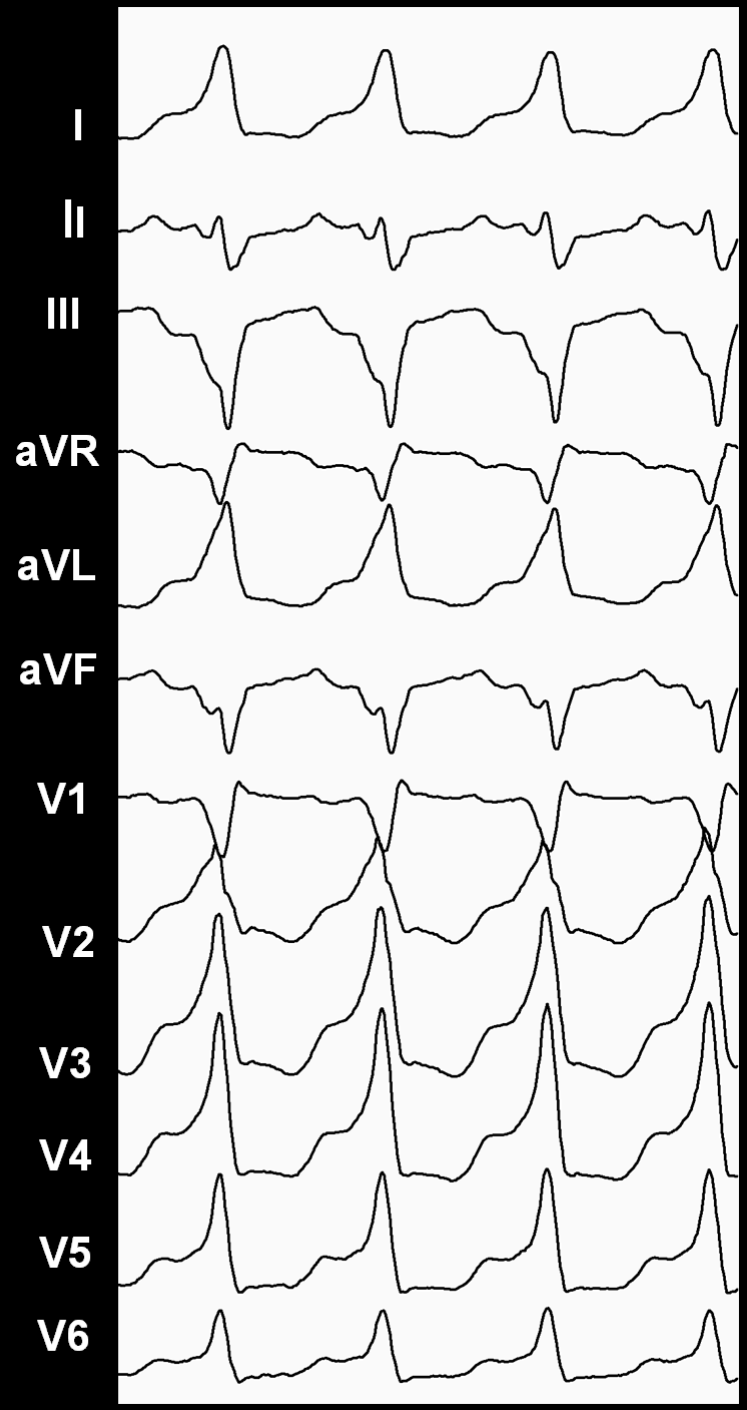
valence in study cohort (post-MI patients with EF≥40%) is estimated at 1.5% (Group A, n=575, MAEs in 9 patients).
The first screening step detects a second subgroup (Group B, n=204) with a MAE prevalence reaching 4.4%.
d screening step detects a third subgroup (Group C, n=41) with a MAE prevalence reaching 22%, eligible for an ICD.

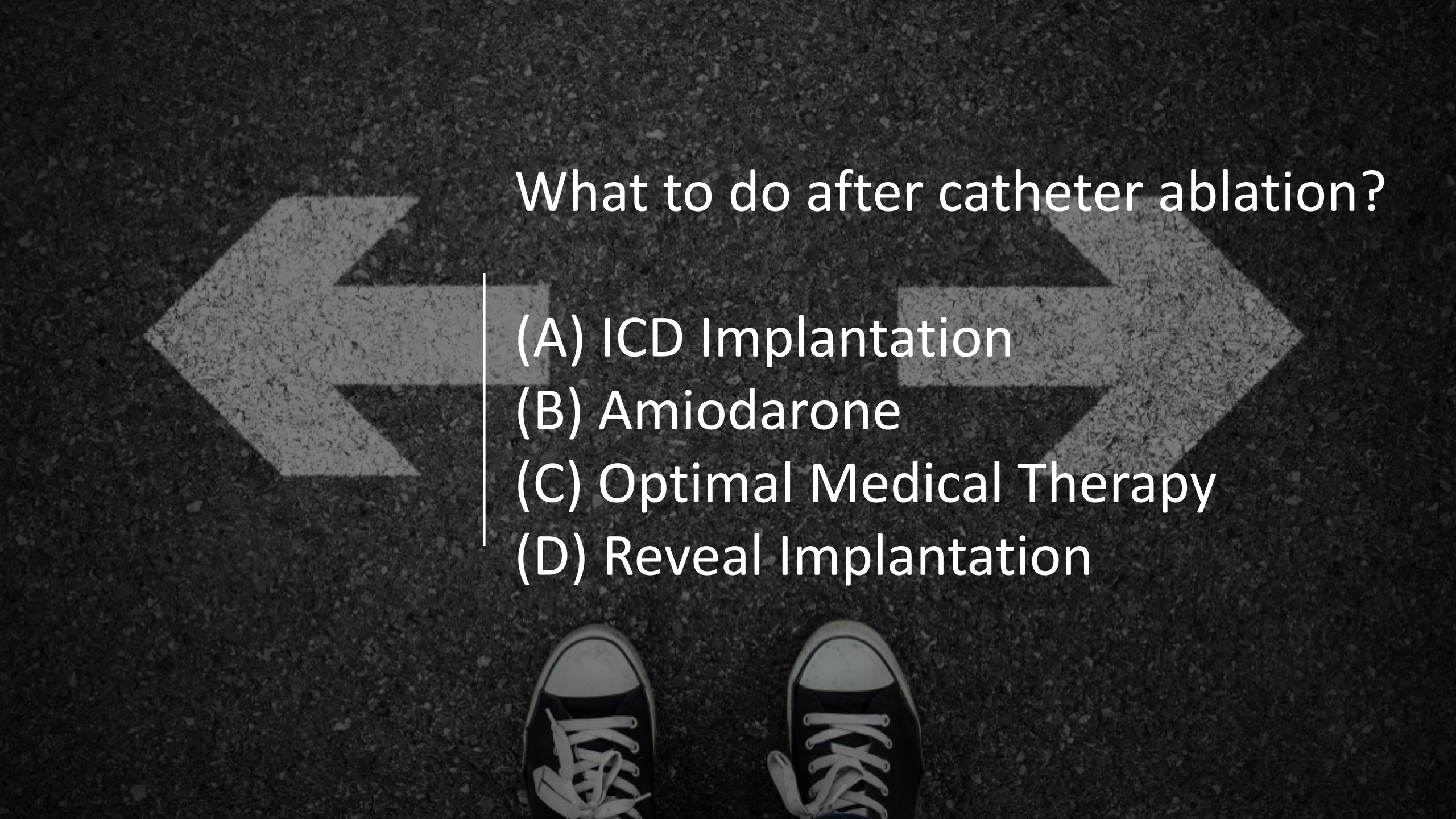
tline of study design and findings. Starting with a cohort exhibiting a prevalence of major arrhythmic events at the 1.5%
w-up), the two-step, programmed ventricular stimulation-inclusive approach allowed for the identification of a high ar-
a major arrhythmic event prevalence reaching 22% (almost 15-fold higher than baseline). LP, late potentials; MAE, major
invasive risk factors; nsVT, non-sustained ventricular tachycardia; PVC, premature ventricular complex.



Inferior View

VT Mapping




What to do after catheter ablation?
(A) ICD Implantation
(B) Amiodarone
(C) Optimal Medical Therapy
(D) Reveal Implantation

European Heart Journal (2014) **35**, 1479–1485
doi:10.1093/eurheartj/ehu040

CLINICAL RESEARCH
Arrhythmia/electrophysiology

Radio-frequency ablation as primary management of well-tolerated sustained monomorphic ventricular tachycardia in patients with structural heart disease and left ventricular ejection fraction over 30%

Philippe Maury[1]*, Francesca Baratto[2], Katja Zeppenfeld[3], George Klein[4], Etienne Delacretaz[5], Frederic Sacher[6], Etienne Pruvot[7], Francois Brigadeau[8], Anne Rollin[1], Marius Andronache[9], Giuseppe Maccabelli[2], Marcin Gawrysiak[3], Roman Brenner[5], Andrei Forclaz[6], Jürg Schlaepfer[7], Dominique Lacroix[8], Alexandre Duparc[1], Pierre Mondoly[1], Frederic Bouisset[1], Marc Delay[1], Meleze Hocini[6], Nicolas Derval[6], Nicolas Sadoul[9], Isabelle Magnin-Poull[9], Didier Klug[8], Michel Haïssaguerre[6], Pierre Jaïs[6], Paolo Della Bella[2], and Christian De Chillou[9]

One hundred and sixty-six patients with structural heart disease (SHD), LVEF over 30%, and well-tolerated SMVT (no syncope) underwent primary radiofrequency ablation without ICD implantation at eight European centres.

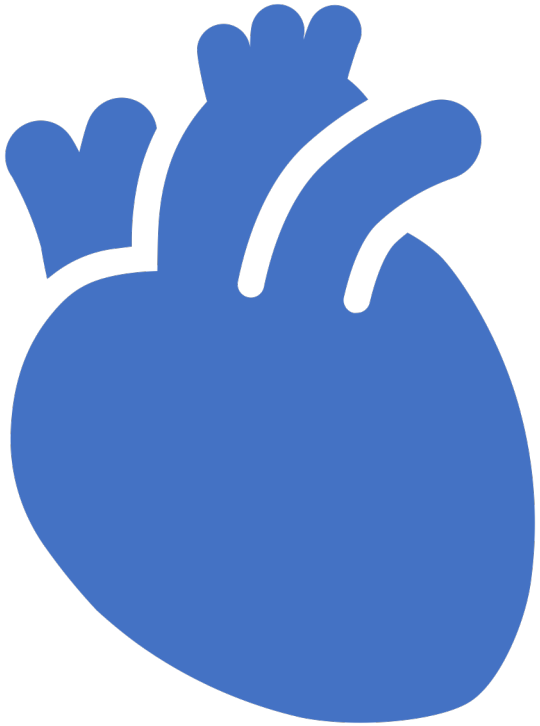
Table 4 Mortality rates and causes of deaths in the patient's population ($n = 166$)

All-cause mortality	20/166 (12%)
Non-cardiac mortality	8/166 (4.8%)
Neoplasy	2
Renal failure	1
Pulmonary cause	2
Neurologic deterioration	1
Cachexy	1
Exact cause NA	1
Cardiac non-arrhythmic mortality	8/166 (4.8%)
Refractory heart failure	7
Electro-mechanical dissociation	1
Sudden death	4/166 (2.4%)

Table 5 Details about the four patients presenting with sudden death during the follow-up

Delay after ablation (months)	1	33	42	75
Underlying heart disease	Valvular	Ischaemic	Ischaemic	Ischaemic
Gender	Male	Male	Male	Male
Age	77	76	60	81
LVEF (%)	65	50	50	43
VT rate (bpm)	140	170	160	135
Symptoms	Palpitations	Near syncope	Chest pain	Near syncope
Inducible after ablation	NA	No	No	Fast VT

Patients with well-tolerated SMVT, SHD, and LVEF>30% undergoing primary VT ablation without a back-up ICD had a very low rate of arrhythmic death and recurrences were generally non-fatal. These data would support a randomized clinical trial comparing this approach with others incorporating implantation of an ICD as a primary strategy.



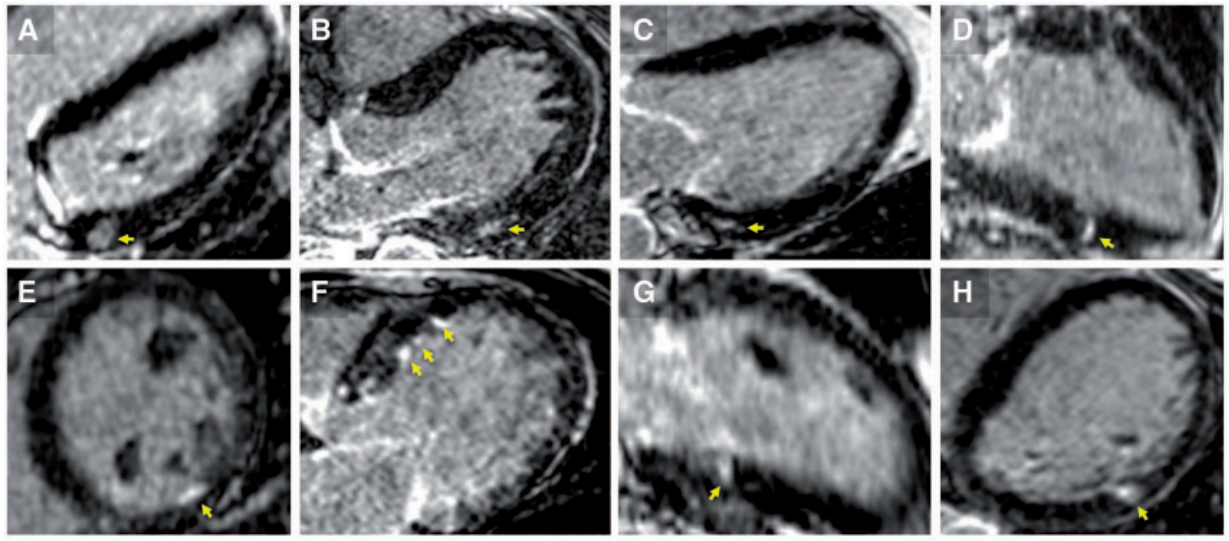
Role of Cardiac Imaging

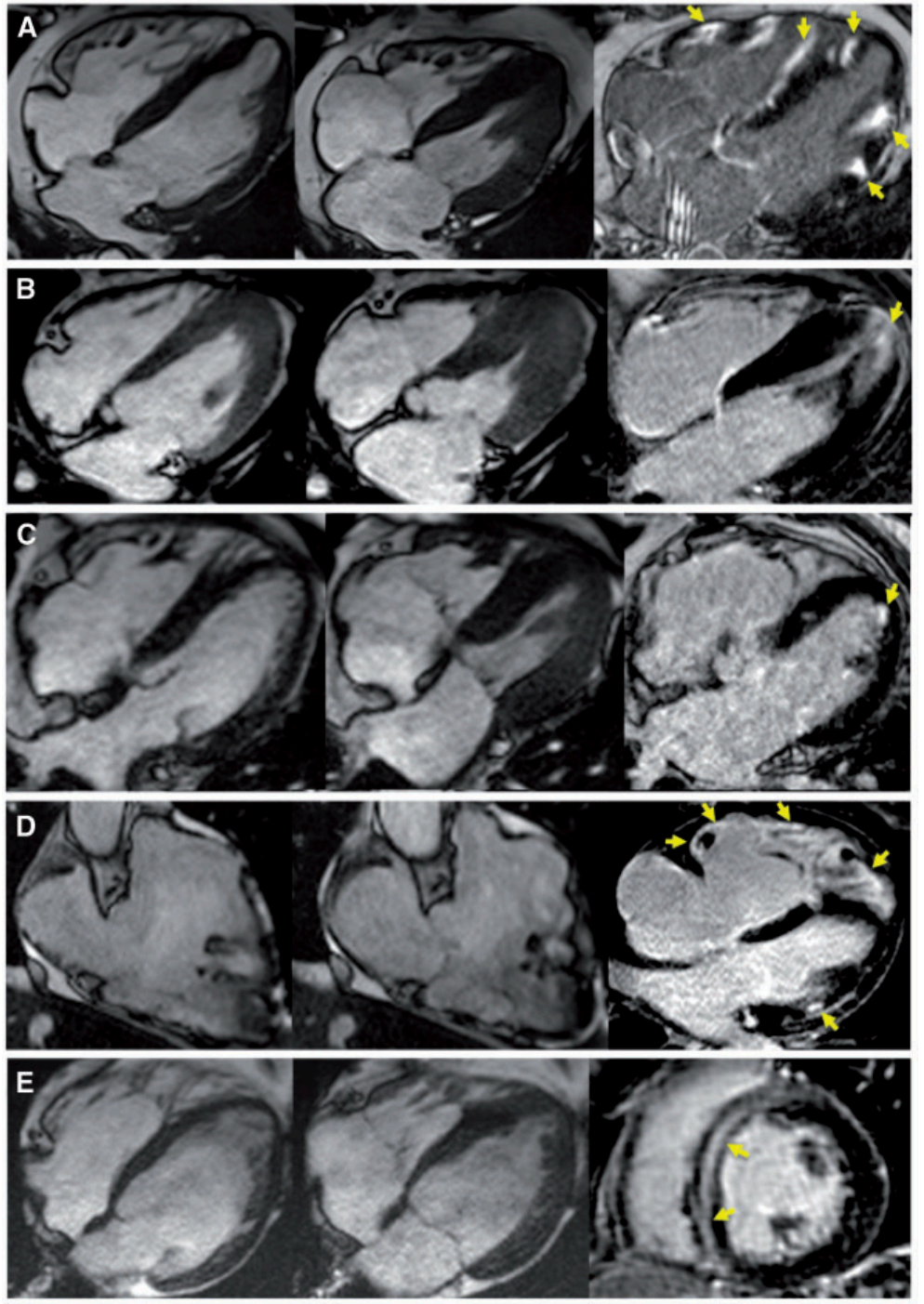
High-resolution three-dimensional late gadolinium-enhanced cardiac magnetic resonance imaging to identify the underlying substrate of ventricular arrhythmia

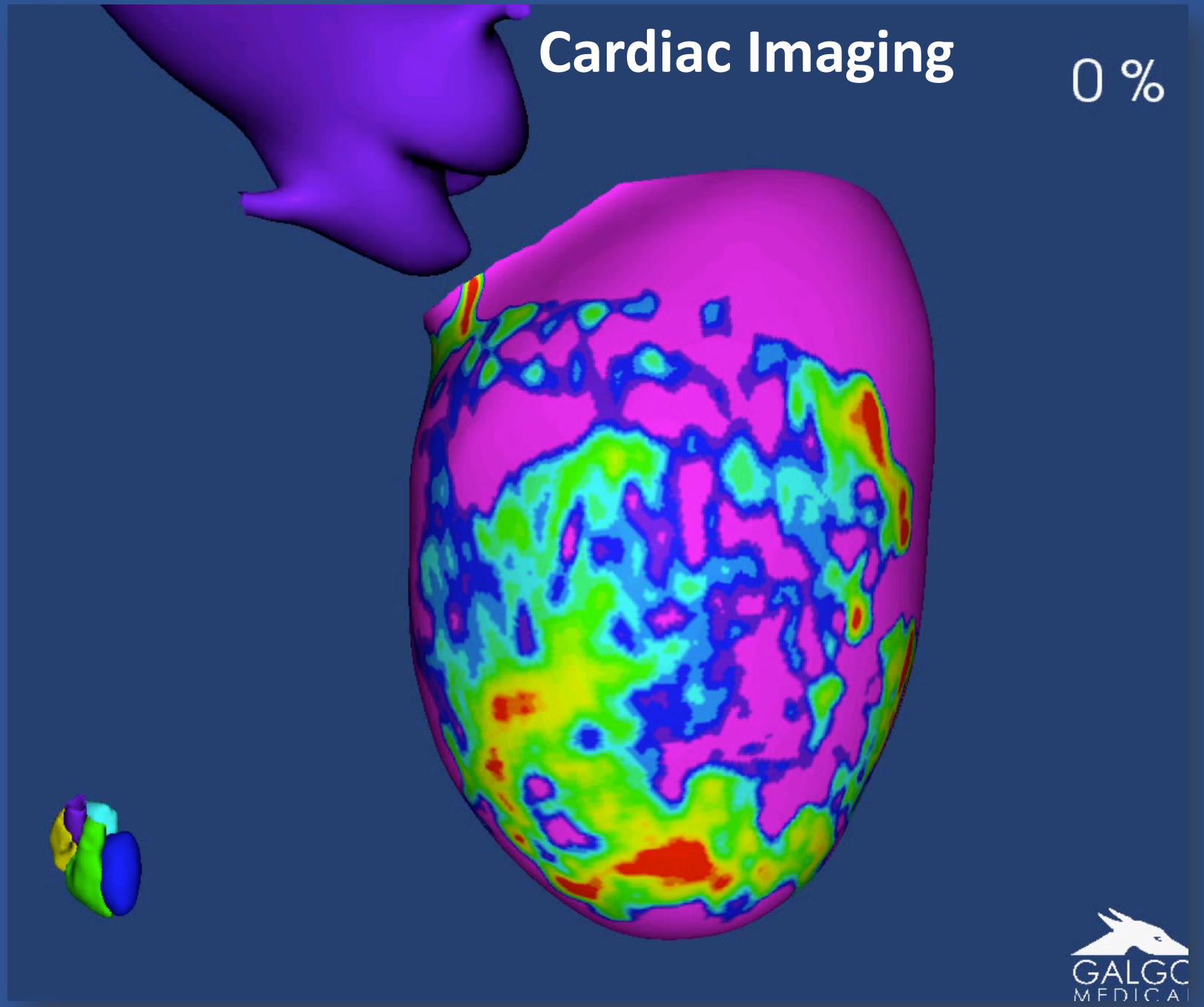
Alexia Hennig[1], Marjorie Salel[1], Frederic Sacher[2,3], Claudia Camaioni[1], Soumaya Sridi[1], Arnaud Denis[2,3], Michel Montaudon[1,3], François Laurent[1,3], Pierre Jais[2,3], and Hubert Cochet[1,3]*

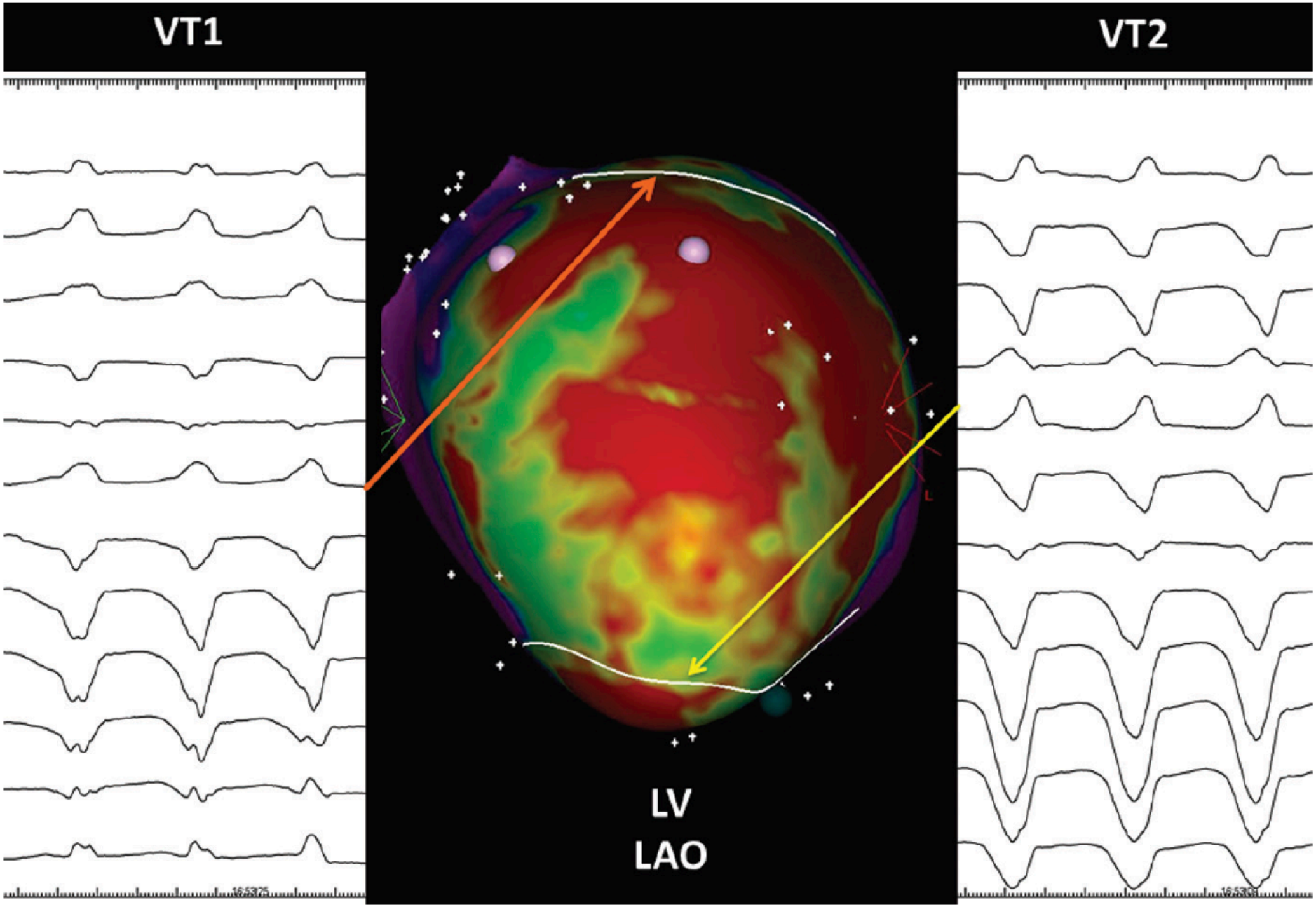
Europace (2018) 20, f179–f191 CLINICAL RESEARCH

In patients with **no prior history of SHD, and negative diagnostic workup** including **TTE and coronary angiography** with VT, VF, or SCD, the diagnostic yield of CMR is high, leading to a diagnostic change in over 40% of these.



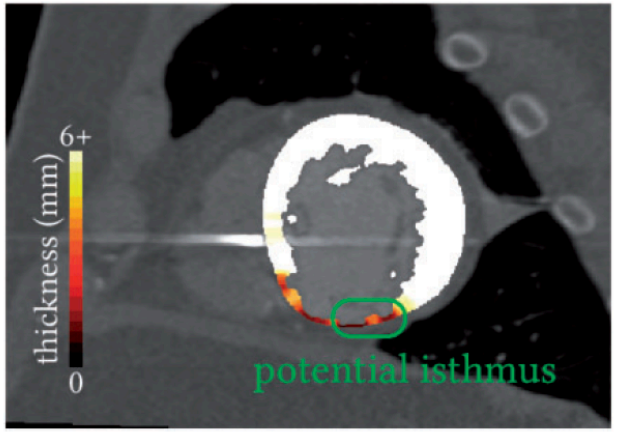


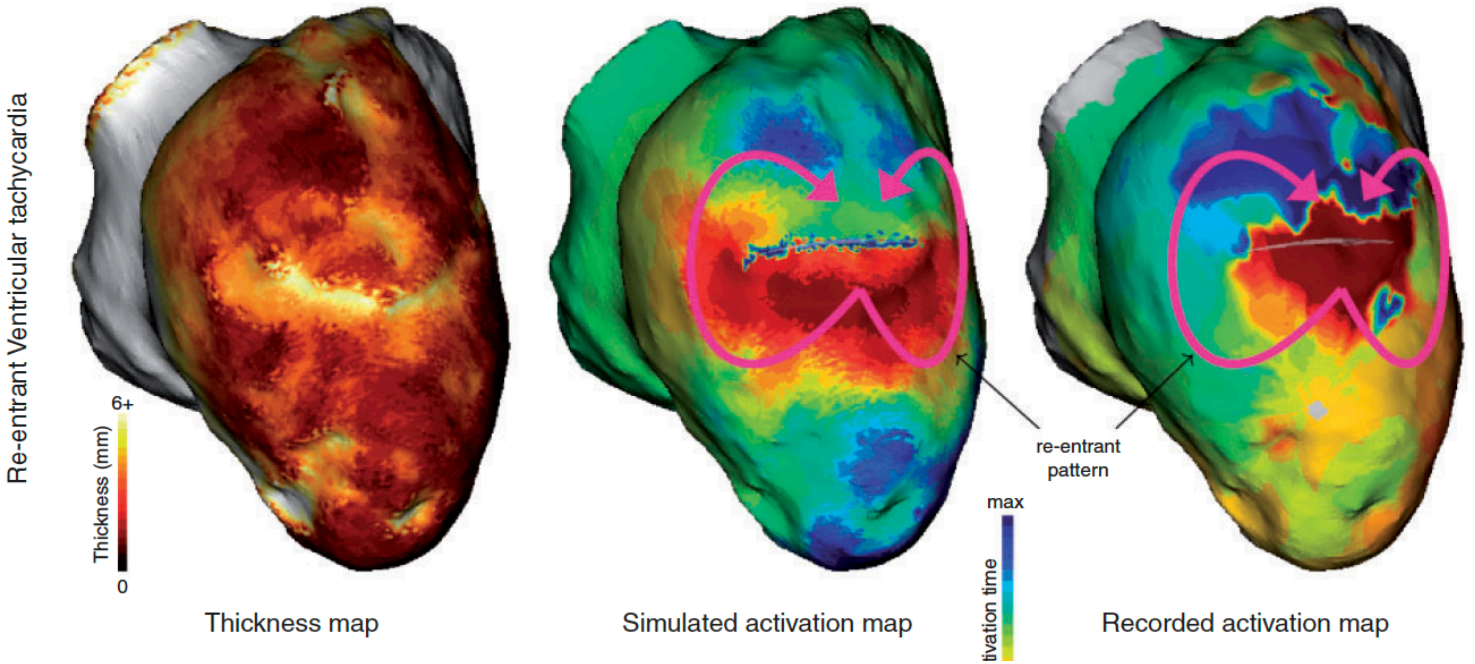

Cardiac Imaging
0 %
GALGC
MEDICAL


VT1
VT2
LV
LAO

Fast personalized electrophysiological models from computed tomography images for ventricular tachycardia ablation planning

The authors aim at building such a pipeline from computed tomography (CT) images to personalized cardiac electrophysiology (EP) model.





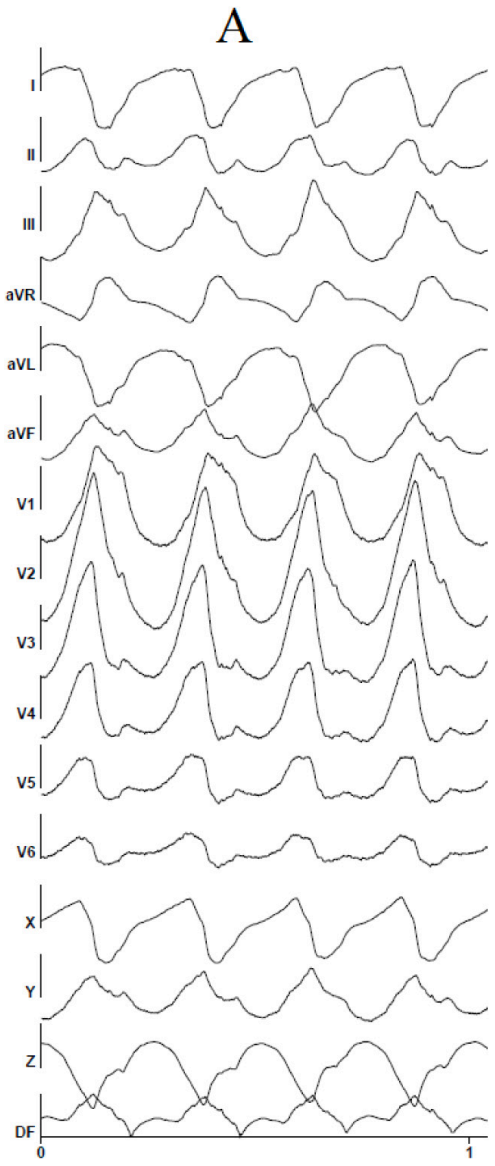
Nicolas Cedilnik et al. Europace (2019) In Press.

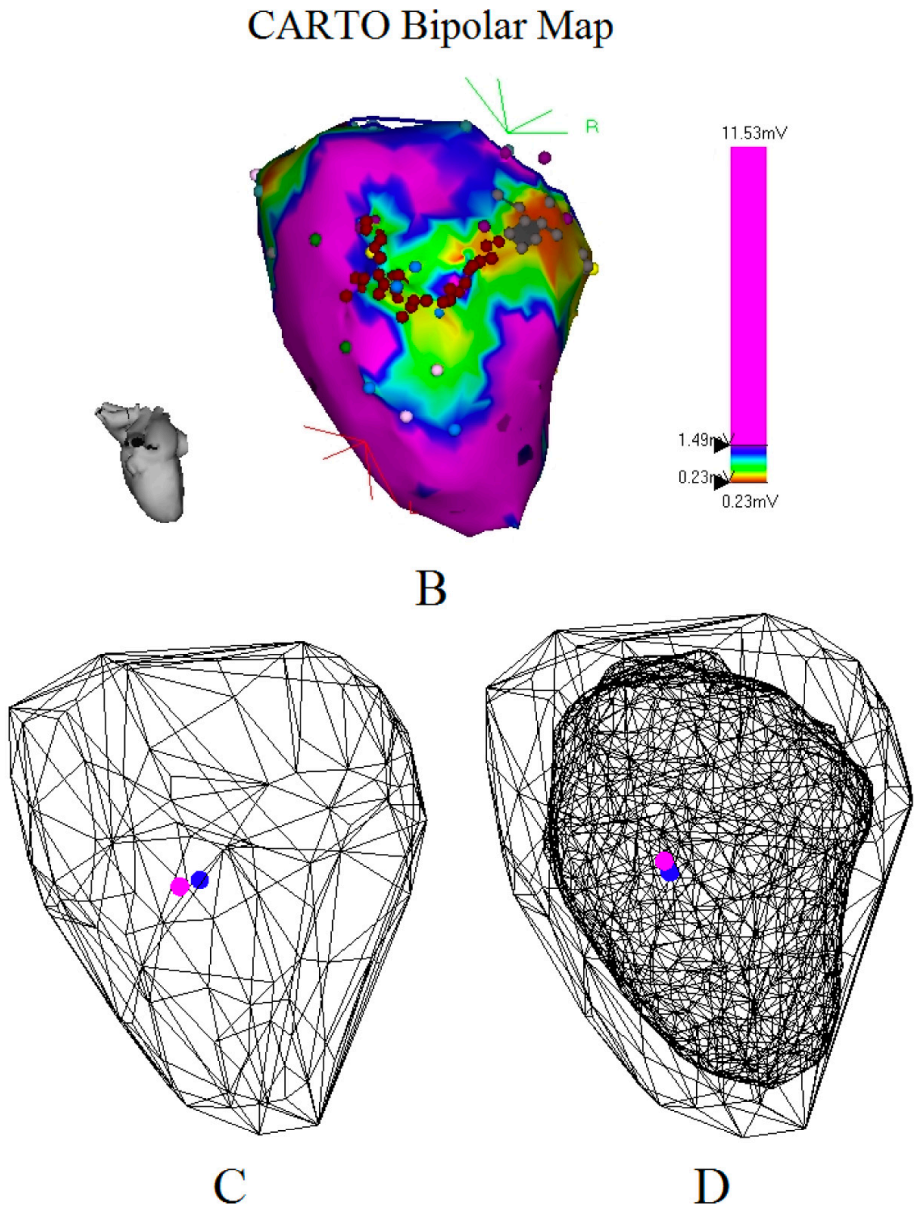
Rapid 12-lead automated localization method: Comparison to electrocardiographic imaging (ECGI) in patient-specific geometry

Shijie Zhou, PhD [a,b], B. Milan Horáček, PhD [b], James W. Warren, BSc [d], Amir AbdelWahab, MD [a,c], John L. Sapp, MD [a,c,*]

Journal of Electrocardiology. 2019: accepted manuscript

With 10 training pacing sites … demonstrated that the automated method achieved localization error of <5mm for the VT-exit site

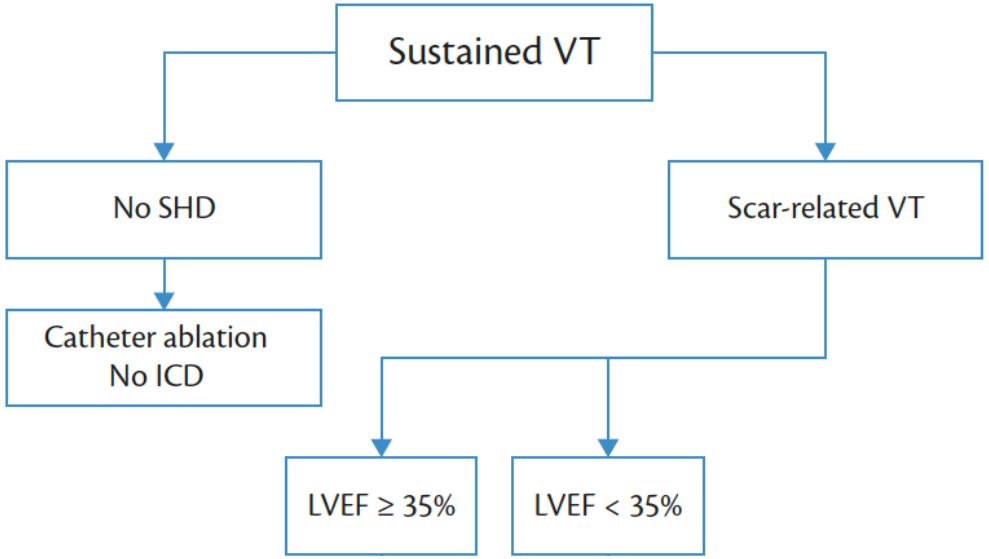


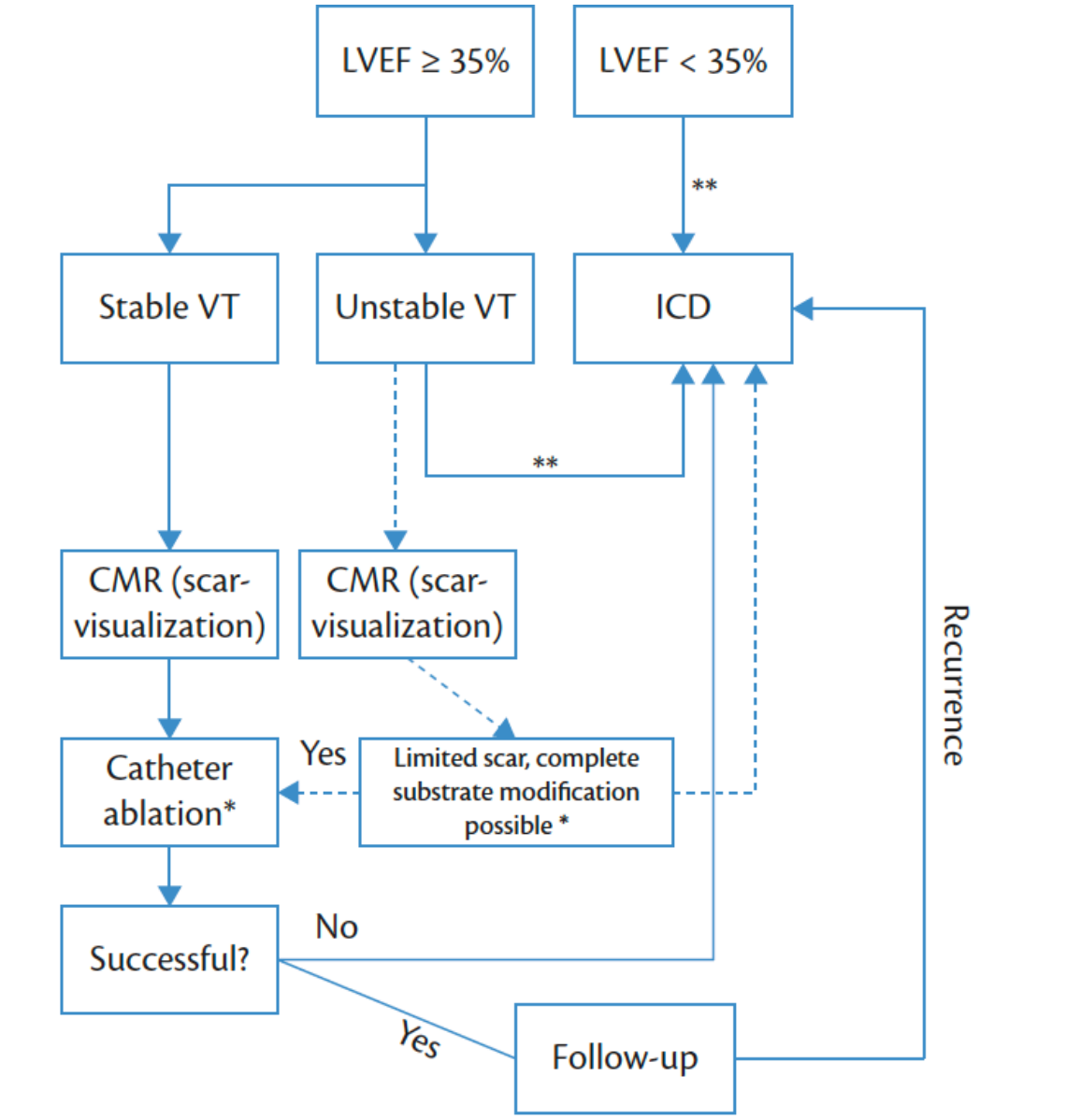


Chapter 43.20 **Secondary prevention of sudden cardiac death after catheter ablation of ventricular tachycardia**

Arash Arya

DOI:10.1093/med/9780198784906.003.0561





* High-volume center, experienced operator
** Catheter ablation should be considered before or after ICD implantation to reduce ICD therapy and improve outcome

The Future of VT Ablation

Artificial Intelligence

Background:

Turing, A. M. On computable numbers with an application to the Entscheidungsproblem. P. Lond. Match. Soc. s2-42, 230–265 (1936).

McCulloch, W. S. & Pitts, W. A logical calculus of the ideas immanent in nervous activity. Bull. Math. Biophys. 5, 115–133 (1943).

Turing, A. M. Computing machinery and intelligence. Mind 59, 433–460, (1950).

Screening for cardiac contractile dysfunction using an artificial intelligence–enabled electrocardiogram

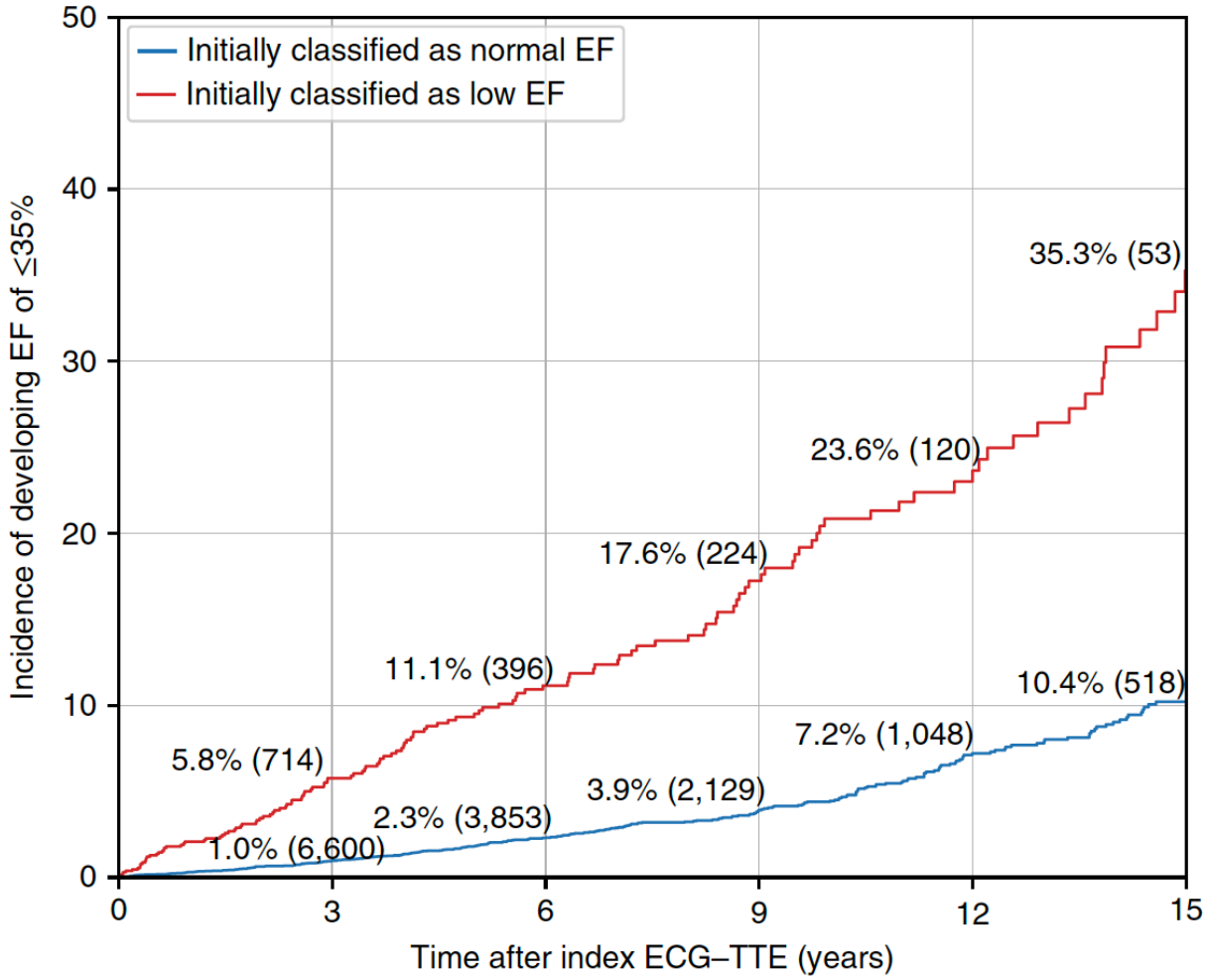
Zachi I. Attia[1], Suraj Kapa[1], Francisco Lopez-Jimenez[1], Paul M. McKie[1], Dorothy J. Ladewig[2], Gaurav Satam[2], Patricia A. Pellikka[1], Maurice Enriquez-Sarano[1], Peter A. Noseworthy[1], Thomas M. Munger[1], Samuel J. Asirvatham[1], Christopher G. Scott[3], Rickey E. Carter[4] and Paul A. Friedman[1*]

Nature Medicine | VOL 25 | 70 JANUARY 2019 | 70–74 | www.nature.com/naturemedicine

Using paired 12-lead ECG and echocardiogram data, including the LVEF, from 44,959 patients at the Mayo Clinic, we trained a convolutional neural network to identify patients with ventricular dysfunction, **defined as ejection fraction ≤ 35%, using the ECG data alone**.

When tested on an independent set of 52,870 patients, the network model yielded values for the area under the curve, sensitivity, specificity, and accuracy of 0.93, 86.3%, 85.7%, and 85.7%, respectively.

In patients without ventricular dysfunction, those with a positive AI screen *were at 4 times the risk (hazard ratio, 4.1; 95% confidence interval, 3.3 to 5.0) of developing future ventricular dysfunction compared with those with a negative screen.*



An artificial intelligence-enabled ECG algorithm for the identification of patients with atrial fibrillation during sinus rhythm: a retrospective analysis of outcome prediction

Zachi I Attia, Peter A Noseworthy*, Francisco Lopez-Jimenez, Samuel J Asirvatham, Abhishek J Deshmukh, Bernard J Gersh, Rickey E Carter, Xiaoxi Yao, Alejandro A Rabinstein, Brad J Erickson, Suraj Kapa, Paul A Friedman*

LANCET: http://dx.doi.org/10.1016/S0140-6736(19)31721-0

… Including all ECGs acquired during the first month of each patient's window of interest (i.e., the study start date or 31 days before the first recorded atrial fibrillation ECG) increased the AUC to 0·90 (0·90–0·91), sensitivity to 82·3% (80·9–83·6), specificity to 83·4% (83·0–83·8), F1 score to 45·4% (44·2–46·5), and overall accuracy to 83·3% (83·0–83·7).

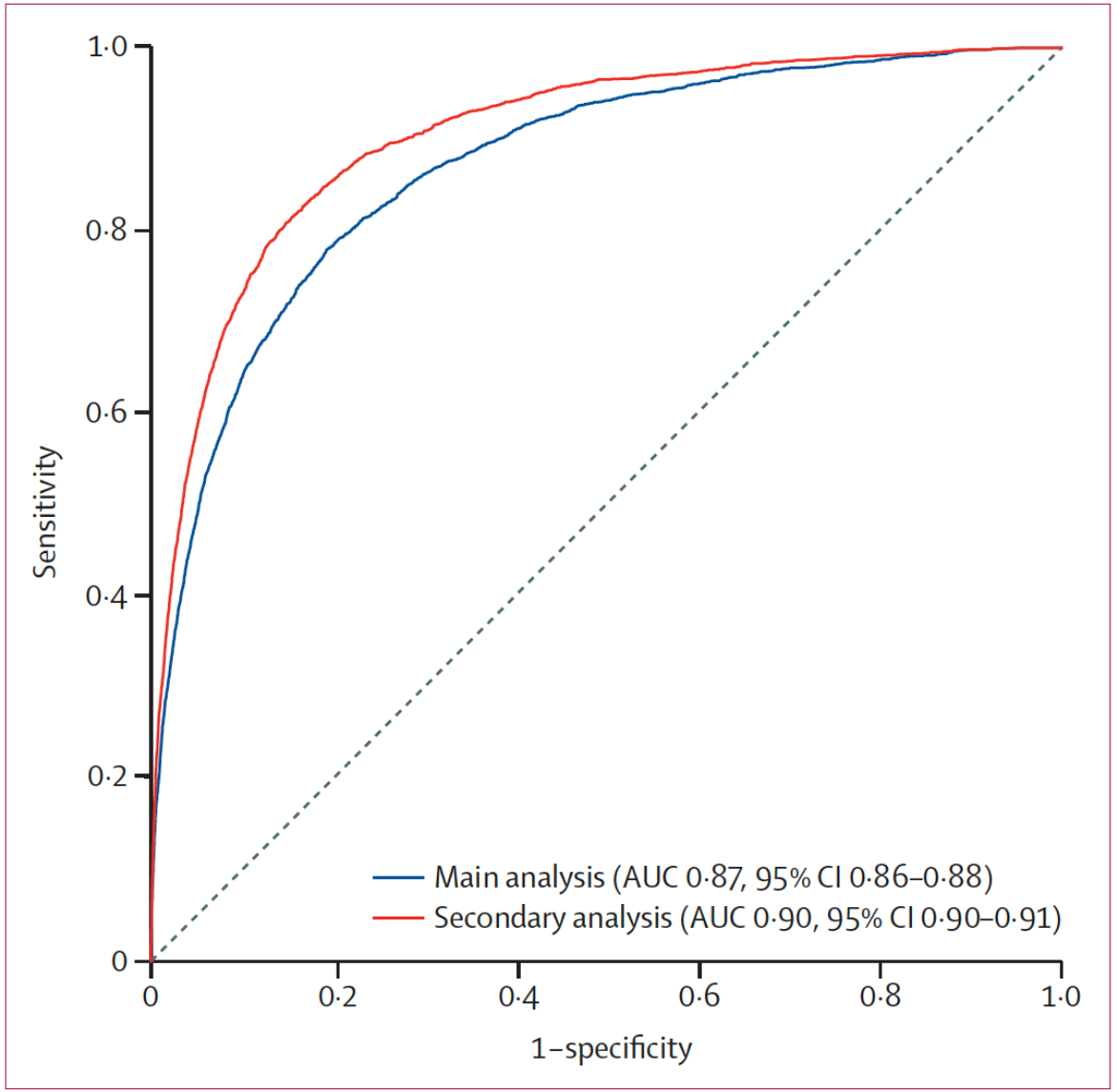


Figure 3: **ROC curves for the convolutional neural networks on the testing dataset**

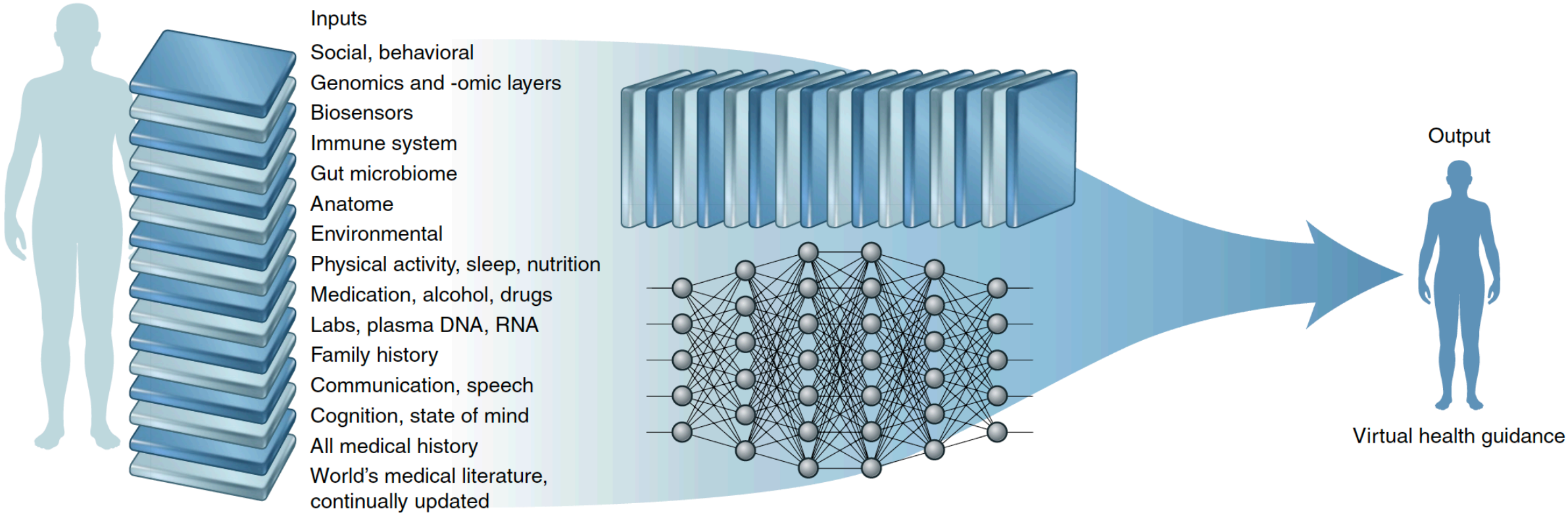


Fig. 3 | The virtual medical coach model with multi-modal data inputs and algorithms to provide individualized guidance. A virtual medical coach that uses comprehensive input from an individual that is deep learned to provide recommendations for preserving the person's health. Credit: Debbie Maizels/ Springer Nature

Nature Medicine **volume 25**, pages44–56 (2019)

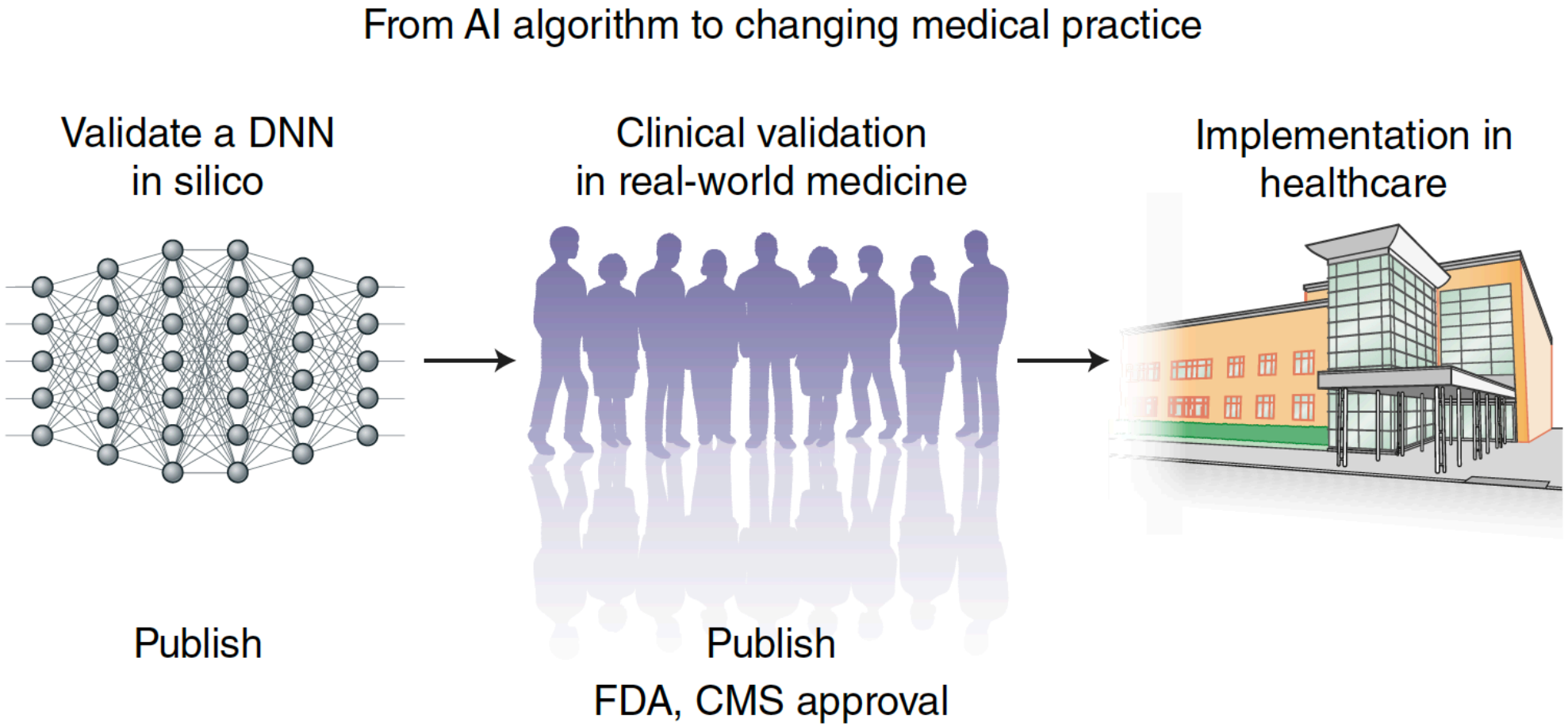
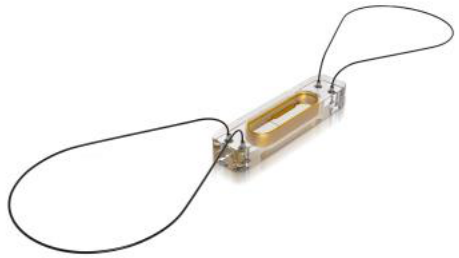
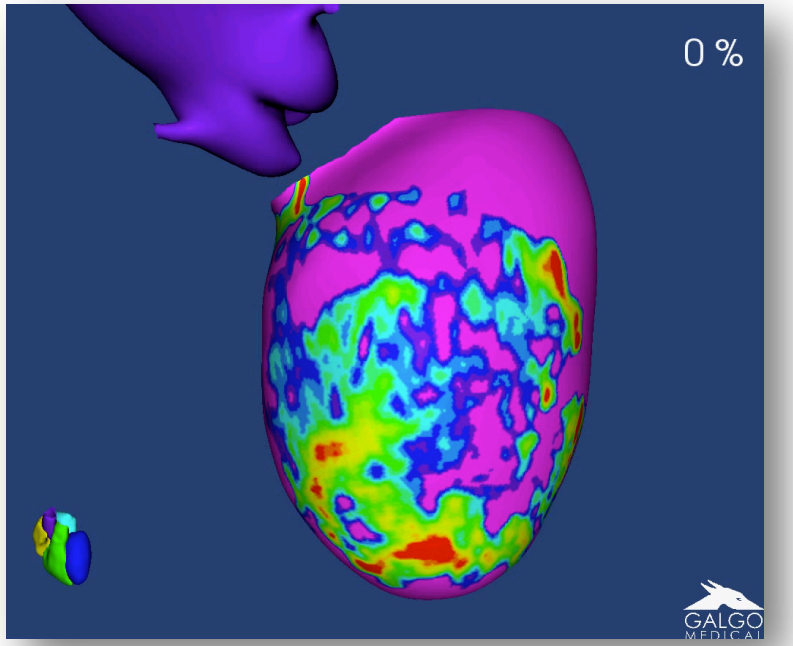
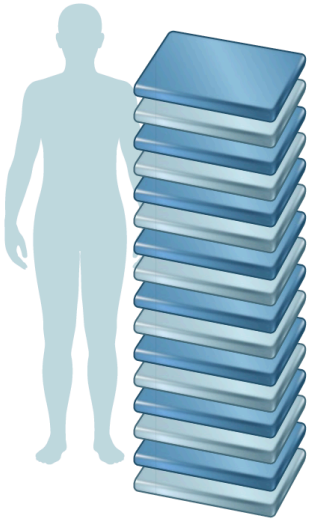


Fig. 4 | Call for due process of AI studies in medicine. The need to publish results in peer-reviewed journals with validation in real-world medicine must be addressed before implementation in patient care can take place. Credit: Debbie Maizels/Springer Nature

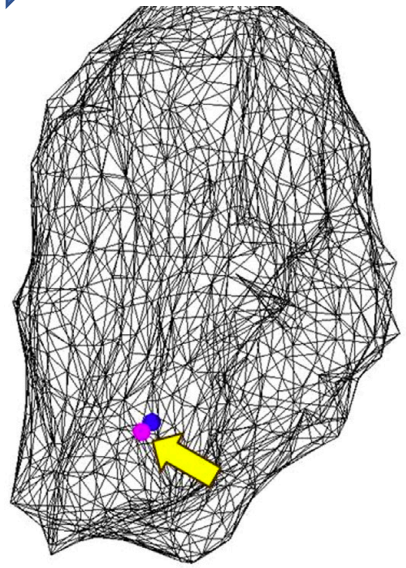
Nature Medicine **volume 25**, pages44–56 (2019)

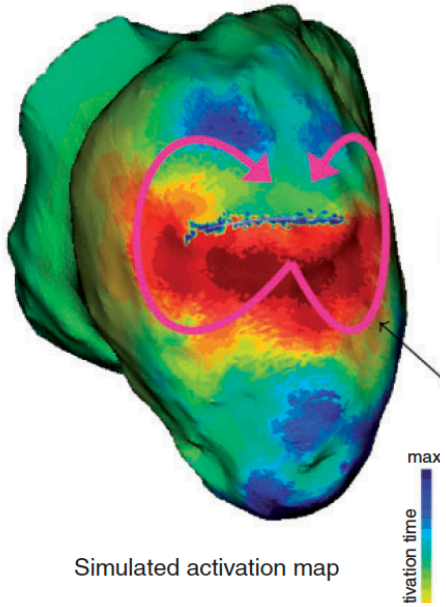






Inputs
Social, behavioral
Genomics and -omic layers
Biosensors
Immune system
Gut microbiome
Anatome
Environmental
Physical activity, sleep, nutrition
Medication, alcohol, drugs
Labs, plasma DNA, RNA
Family history
Communication, speech
Cognition, state of mind
All medical history
World's medical literature, continually updated





Simulated activation map

The best way to predict the future is to create it.

Peter Drucker

Yes!

We will be able to predict and prevent SCD in the near future.

Thank you for your attention!