

Nichtinvasive Ablation von Kammertachykardien



HERZZENTRUM
LEIPZIG

Arash Arya





Disclosures:

NONE

Herbsttagung Schkopau 15 - 16 November 2019



Non Invasive Ablation of Ventricular Tachycardias

Current perspective and future direction

Nichtinvasive Ablation von Kammertachyka[...]

PDF-Dokument [24.8 MB]

CardioSummit Berlin 04 - 05 October 2019



Can VT Ablation Prevent Sudden Cardiac Death?

Current Perspective and Future Direction

Can VT Ablation Prevent SCD.pdf

PDF-Dokument [40.6 MB]

Patienten-Seminar: 25 Jahren Herzzentrum Leipzig, 28.09.2019



Bringen Medikamente die Libido durcheinander?

Nur für Patienten geeignet

Sexuelle Dysfunktion bei Herzpatienten.p[...]

PDF-Dokument [9.3 MB]

2019 HRS/EHRA Focused Update on Optimal ICD Programming



Optimal ICD Programming and Testing

2019 HRS/EHRA Update

optimal ICD programming and Testing.pdf

PDF-Dokument [1.7 MB]

Überblick:

Nichtinvasive Ablation von Kammertachykardien



Aktuelle Studien

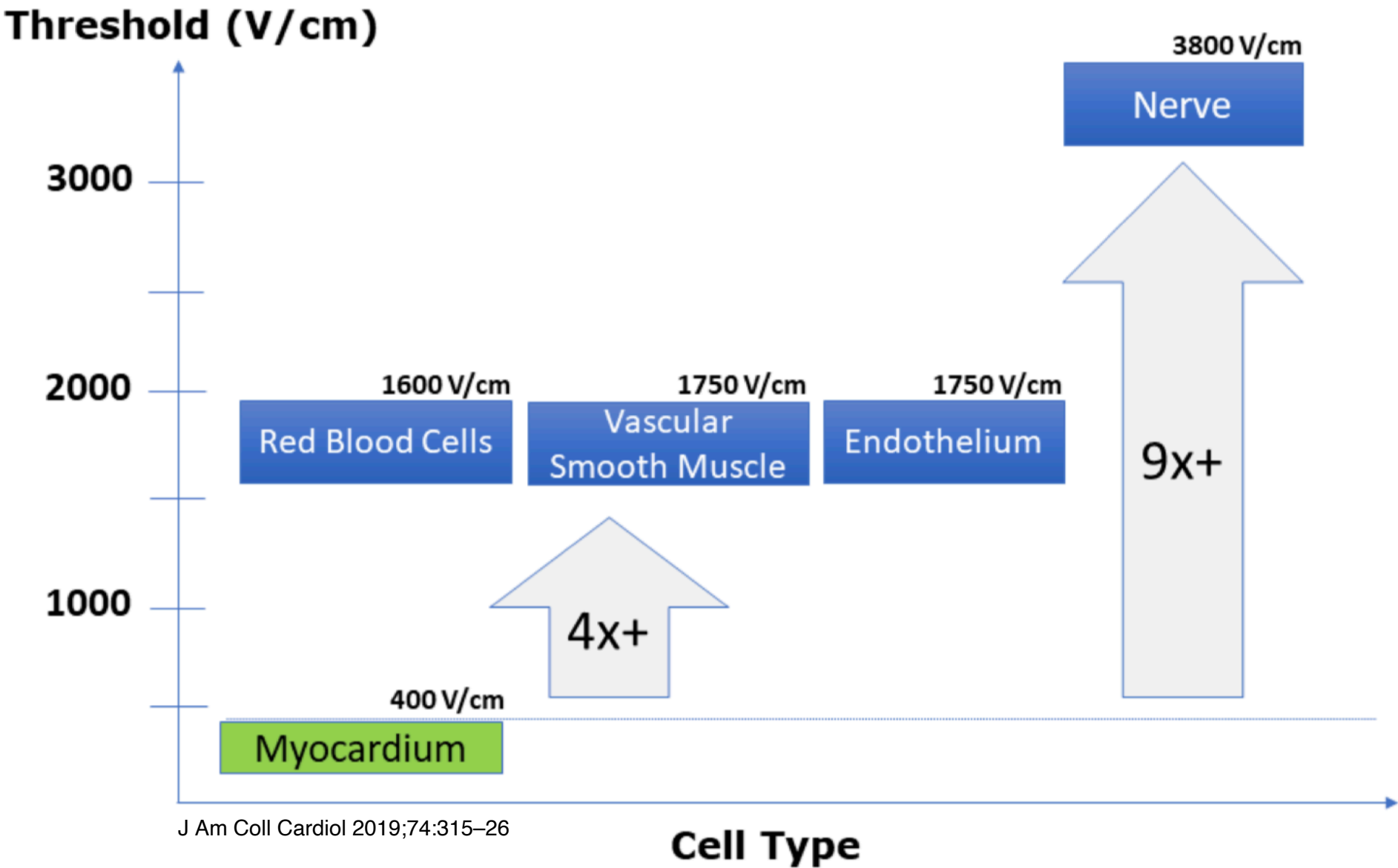


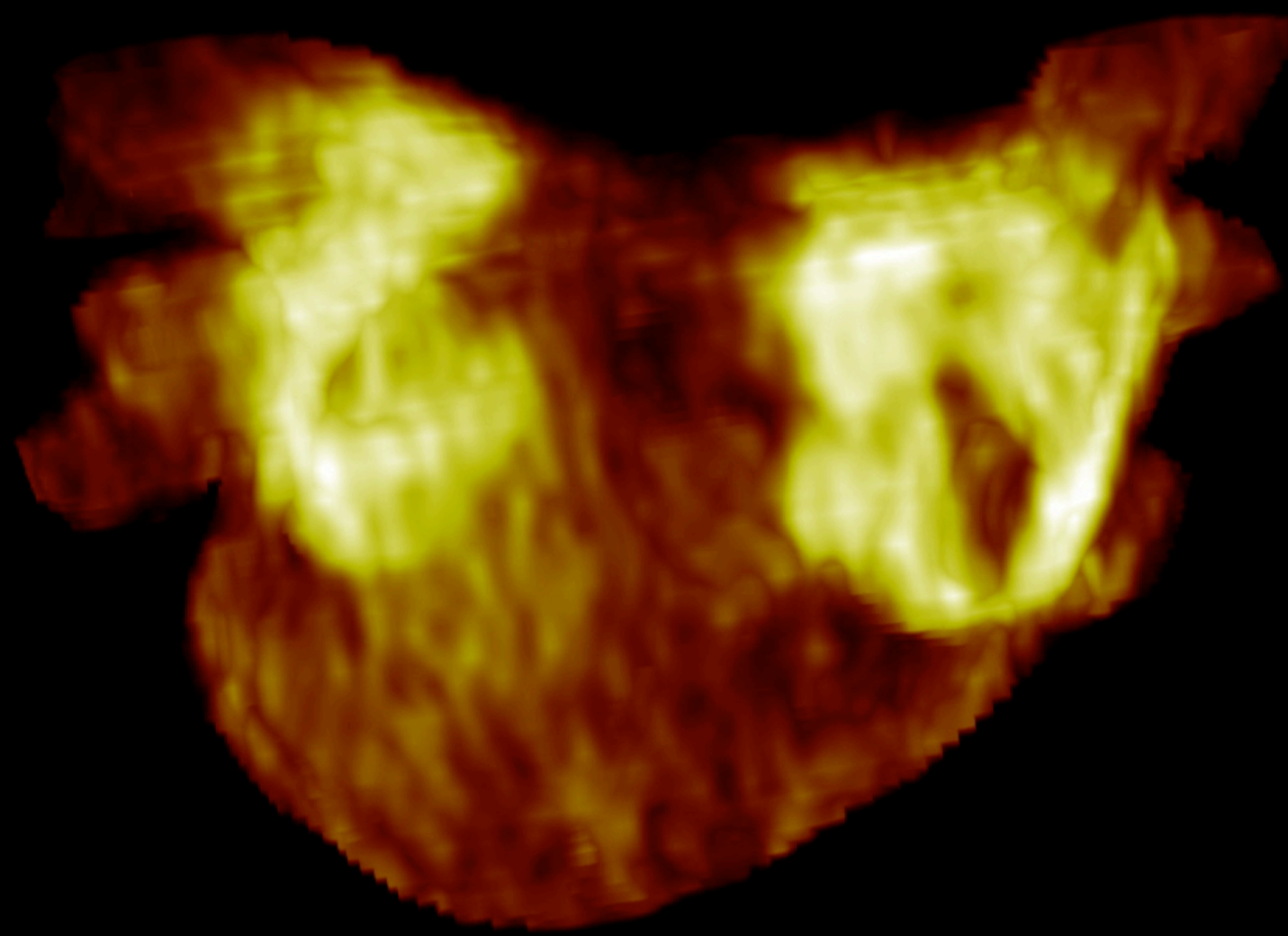
Meine Vision

VT refractory to conventional Ablation:

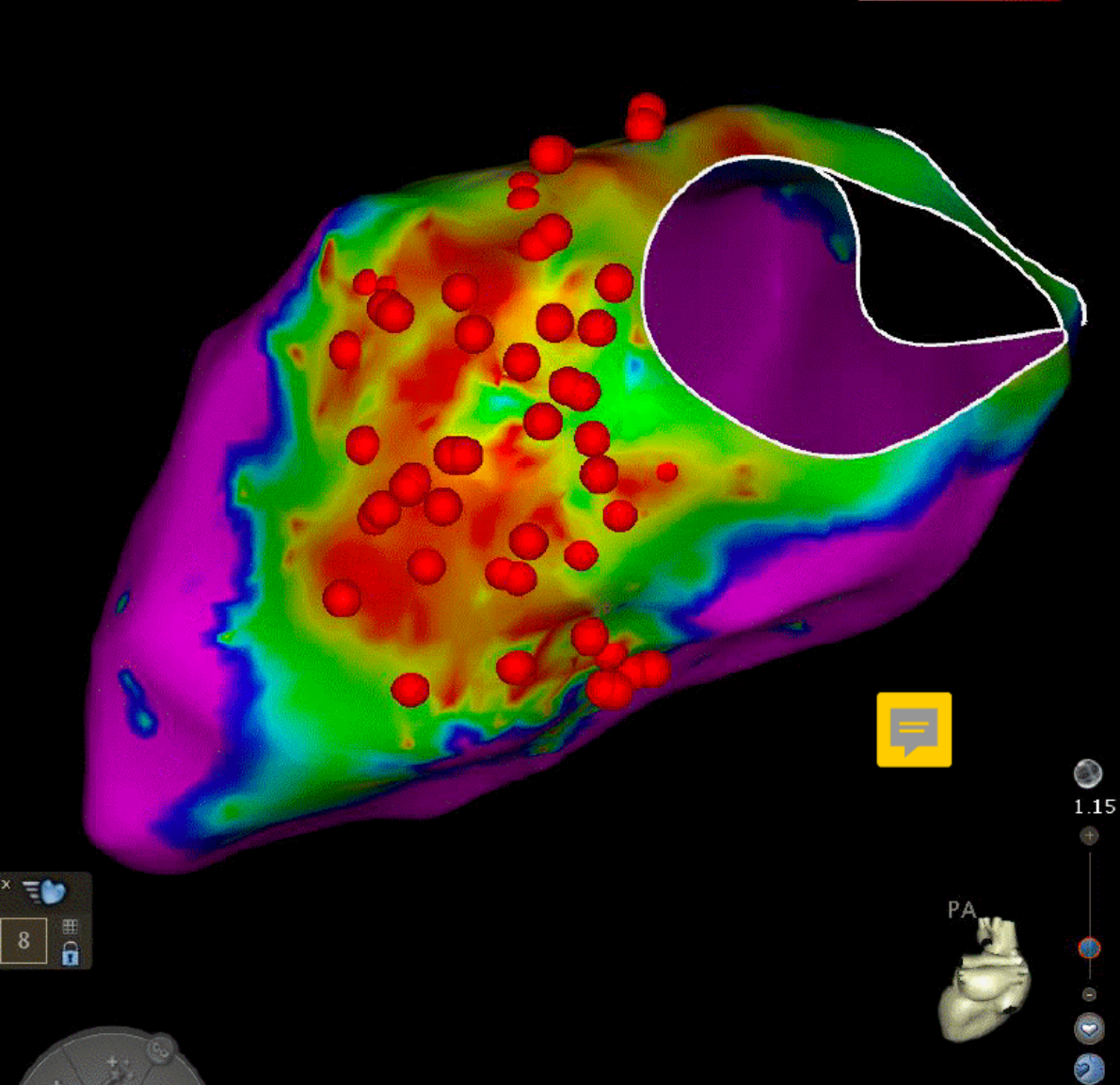
- Increase Power
- Change Catheter
- Using Half-Saline Irrigation
- Bipolar Ablation
- Alcohol Ablation
- Bilateral surgical sympathectomy
- Stereotactic Radio-Surgery
- Electroporation

Supplemental Figure S2: Thresholds of Various Cell Types to PFA

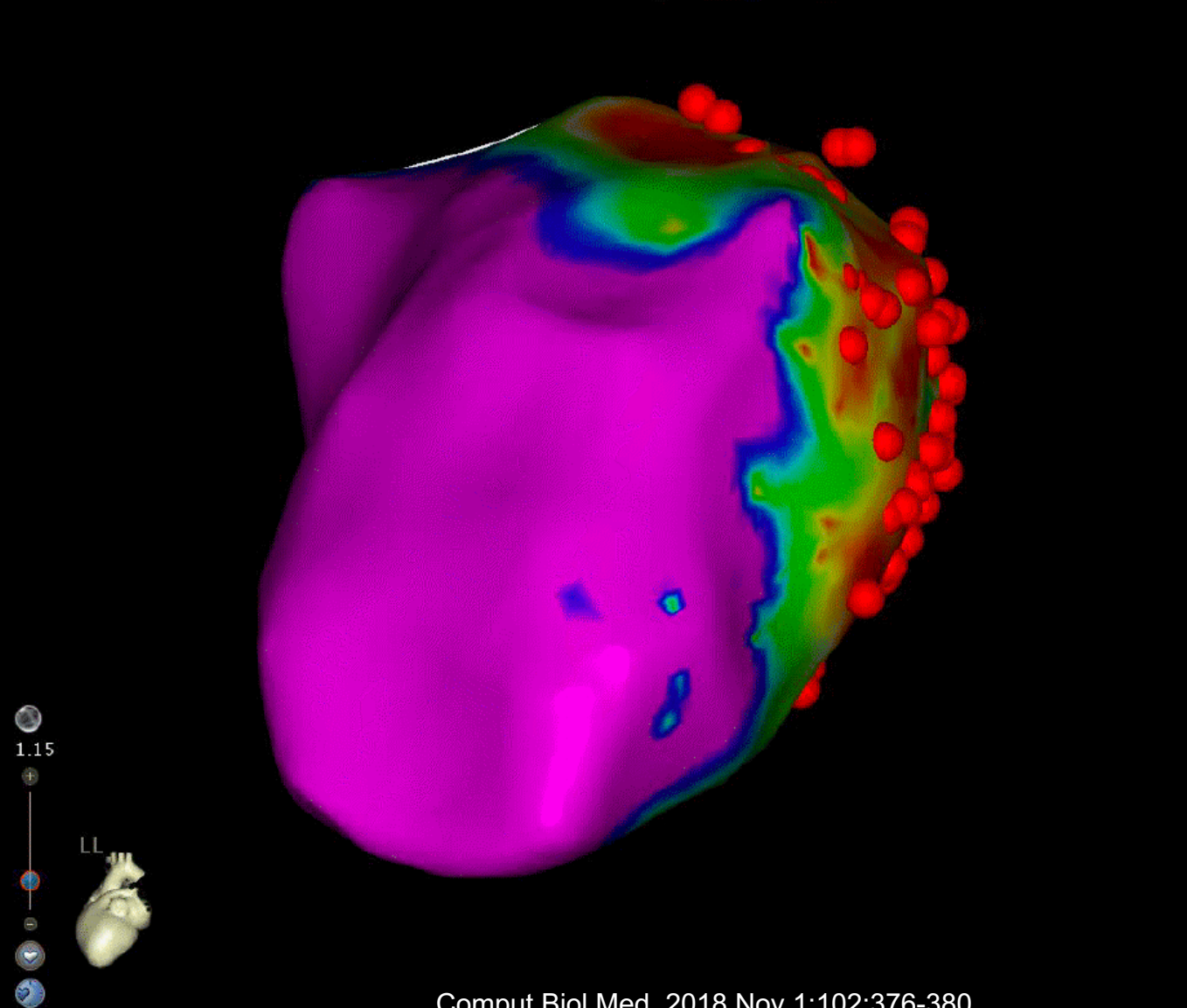




10-... (360, 0) Resp
Correlations: ☐ Unmatched ☒ Matched
0.10 mV Bi 1.50 mV
0.00 s T.Time 1.00 s



10-... (360, 0) Resp
Correlations: ☐ Unmatched ☒ Matched
0.00 s T.Time 1.00 s
0.10 mV Bi 1.50 mV



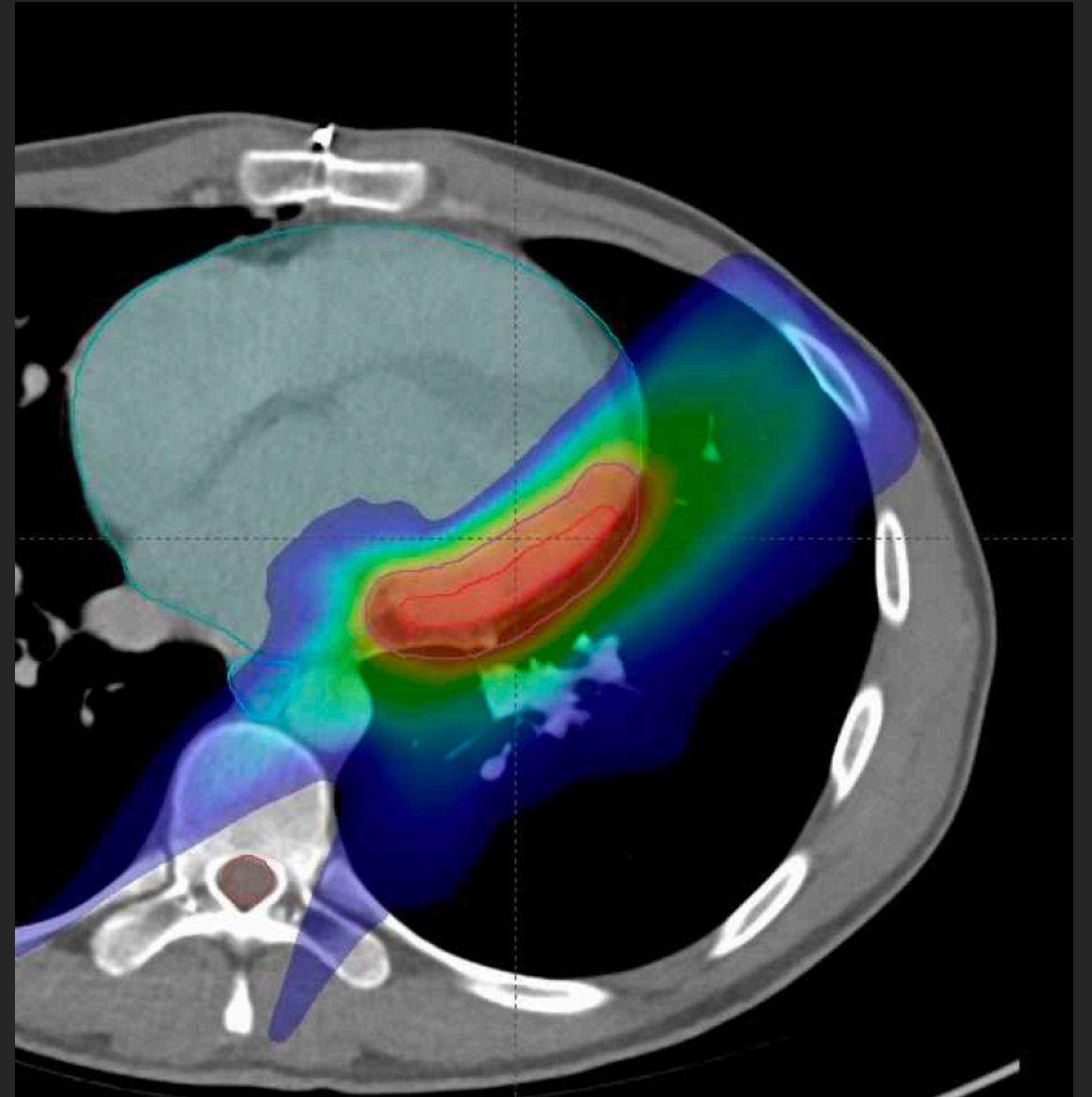
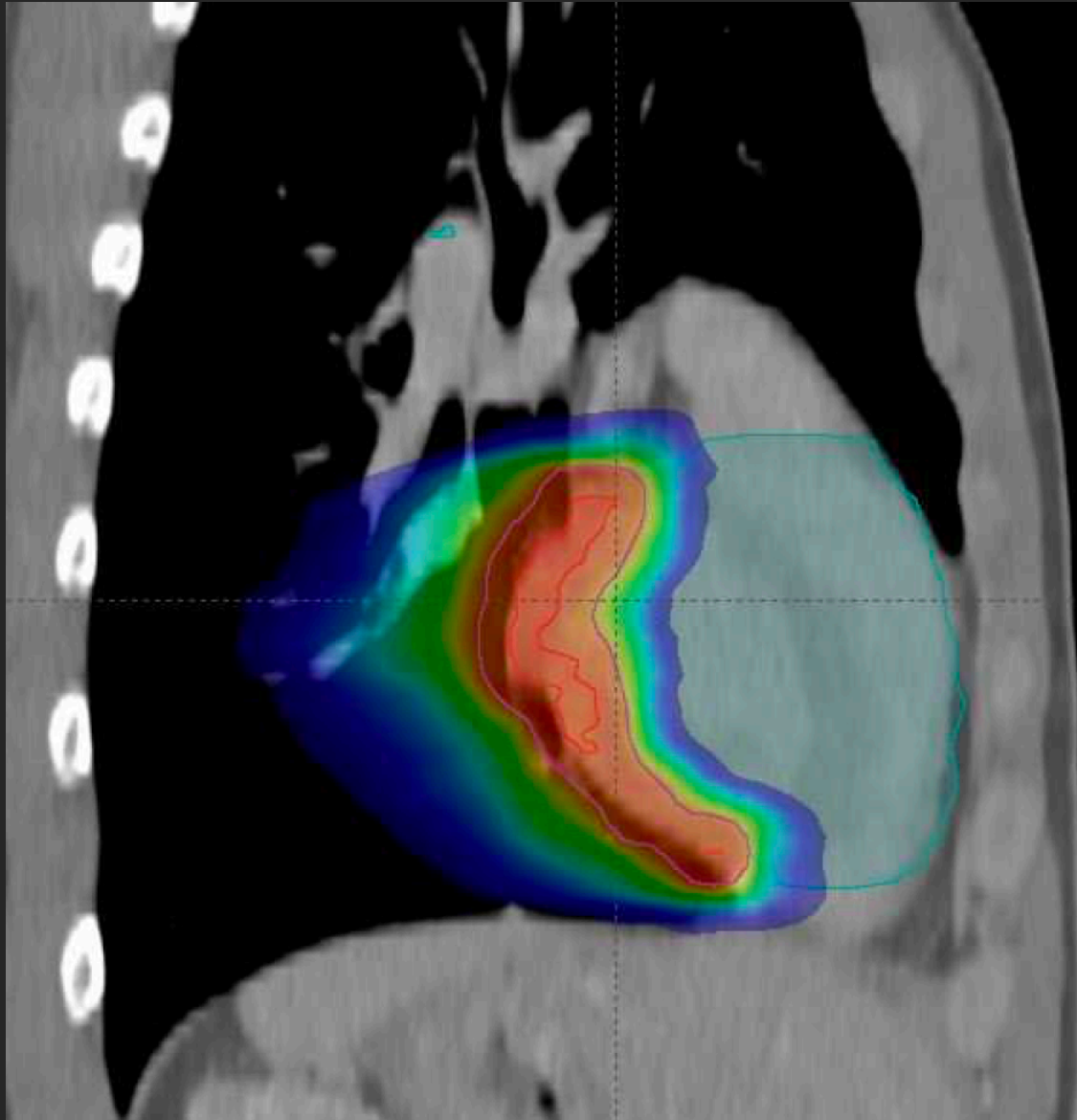


Table 1 Shown are key differences between conventional catheter ablation and stereotactic arrhythmia radioablation

	Catheter ablation	Stereotactic arrhythmia radioablation
Energy source	Radiofrequency energy, cryoablation, others	Ionizing radiation
Pathophysiology of tissue destruction	Tissue heating or freezing leading to necrosis	Likely apoptosis and micro-vascular injury
Time course for lesion formation	Seconds to minutes	Days to months
Tissues that can be targeted	Local injury to tissue in direct contact or close-by proximity to ablative catheter; therefore, tissues accessible by catheter can be ablated	Any tissue is theoretically ablatable
Lesion geometry	Point lesions or planar lesions in contact with catheters	3-dimensional volume
Benefits	• Established technology • Near-immediate effect	• Noninvasive • Any tissue is potentially ablatable, including deep targets • 3D ablation volume can be created
Risks	• Invasive risks • Collateral injury	• Radiation injury • Unknown late side effects

ORIGINAL ARTICLE

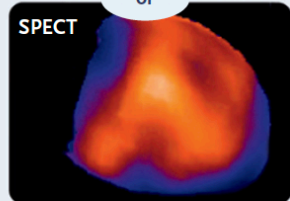
Noninvasive Cardiac Radiation for Ablation of Ventricular Tachycardia

Phillip S. Cuculich, M.D., Matthew R. Schill, M.D., Rojano Kashani, Ph.D.,
Sasa Mutic, Ph.D., Adam Lang, M.D., Daniel Cooper, M.D.,
Mitchell Faddis, M.D., Ph.D., Marye Gleva, M.D., Amit Noheria, M.B., B.S.,
Timothy W. Smith, M.D., D.Phil., Dennis Hallahan, M.D., Yoram Rudy, Ph.D.,
and Clifford G. Robinson, M.D.

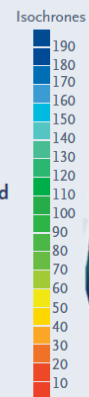
Visualize Anatomical Scar



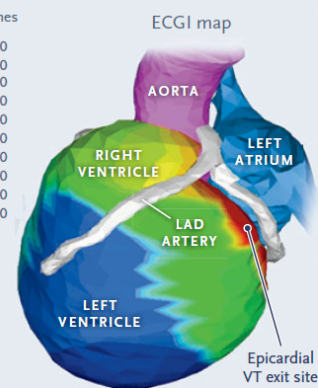
or



and

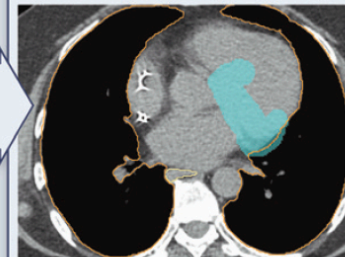


Perform EP Mapping



Identify Arrhythmogenic Scar Substrate

Create a contoured target volume



Position



Develop Plan

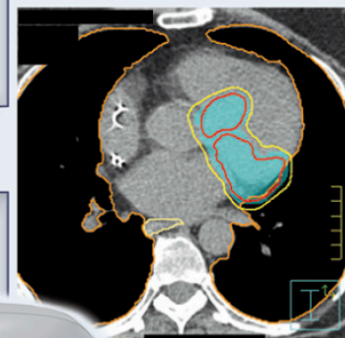
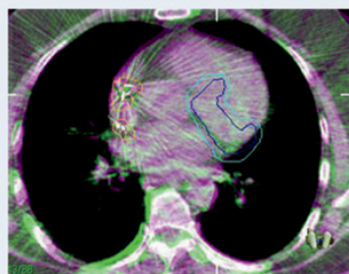


Image and Align



Treat

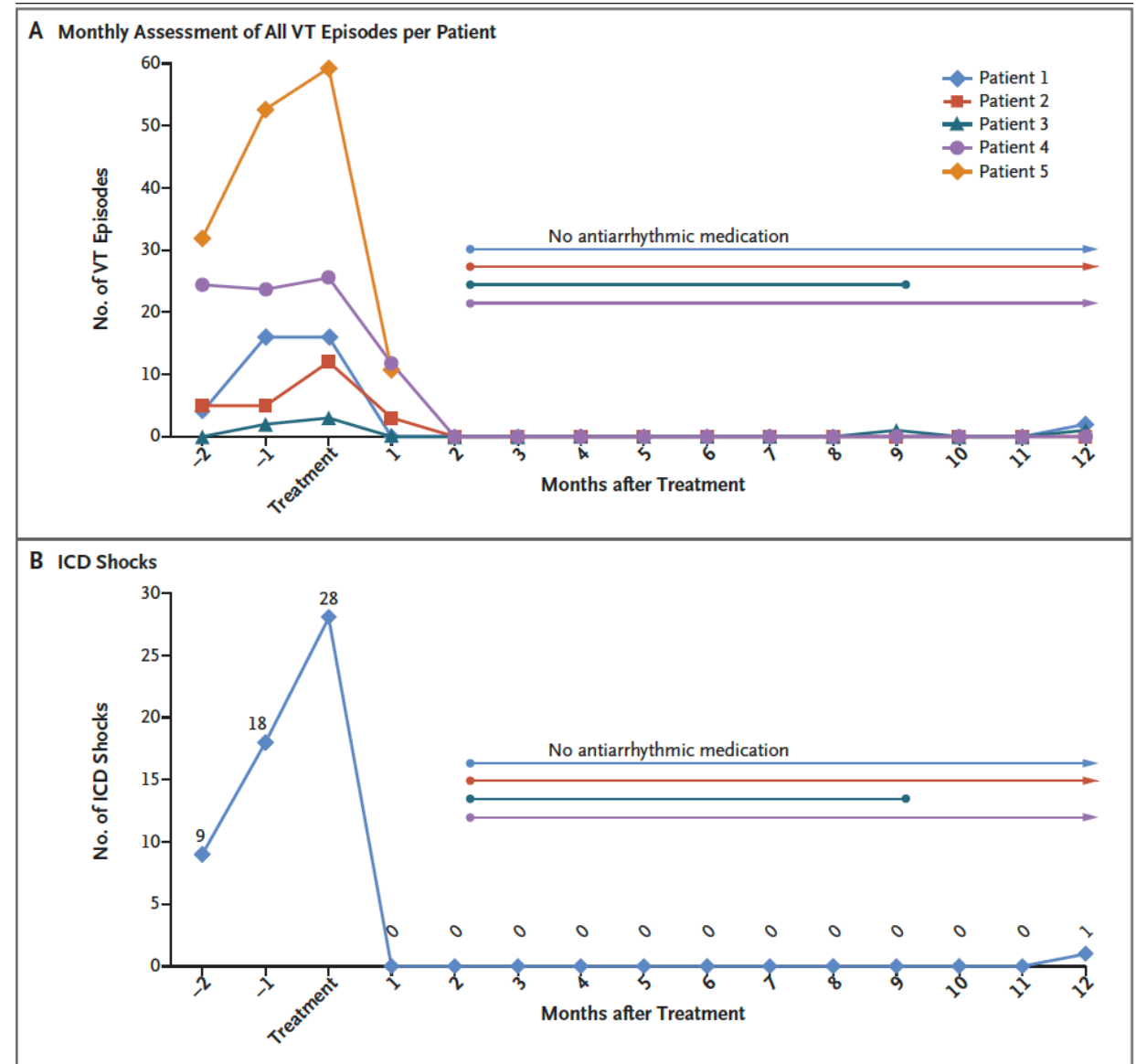


From April through November 2015, five patients with high-risk, refractory VT underwent treatment.

The mean noninvasive ablation time was 14 minutes (range, 11 to 18).

During the 3 months before treatment, the patients had a combined history of 6577 episodes of ventricular tachycardia.

After the 6-week blanking period, there were 4 episodes of ventricular tachycardia over the next 46 patient-months, for a reduction from baseline of 99.9%.





ESC

European Society
of Cardiology

Europace (2019) **21**, 1088–1095

doi:10.1093/europace/euz133

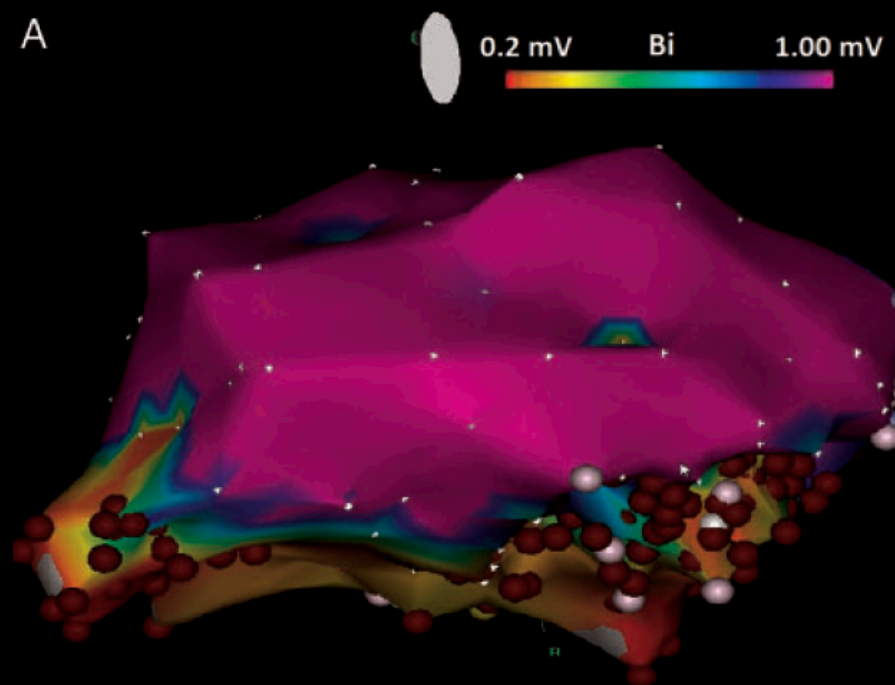
CLINICAL RESEARCH

Ablation for ventricular tachycardia

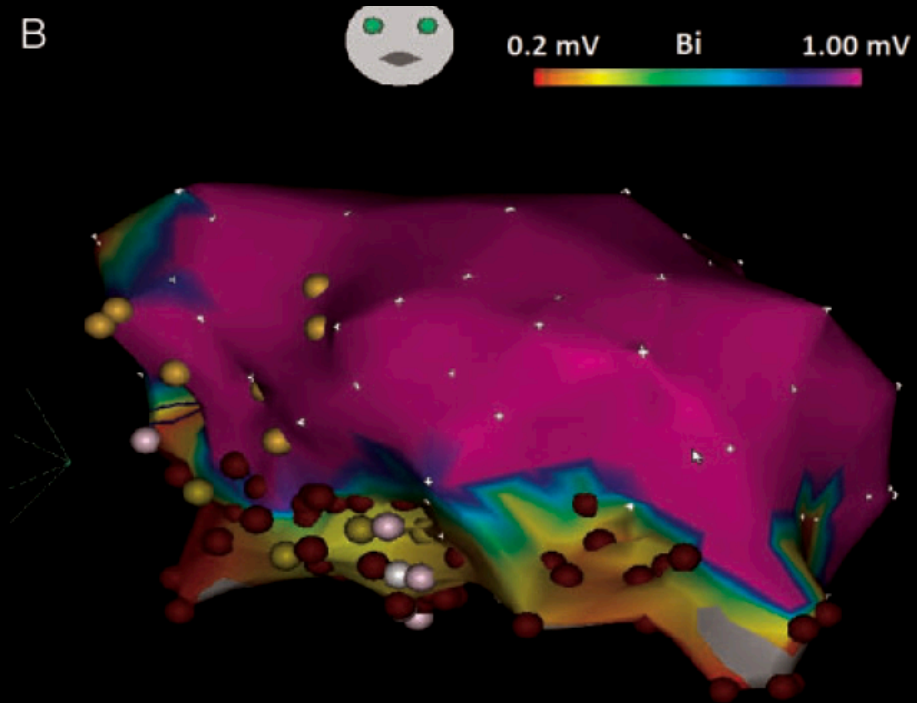
Stereotactic radiosurgery for ablation of ventricular tachycardia

**Radek Neuwirth¹, Jakub Cvek ^{2*}, Lukas Knybel², Otakar Jiravsky³,
Lukas Molenda², Michal Kodaj³, Martin Fiala¹, Petr Peichl⁴, David Feltl⁵,
Jaroslav Januška³, Jan Hecko³, and Josef Kautzner⁴**

A

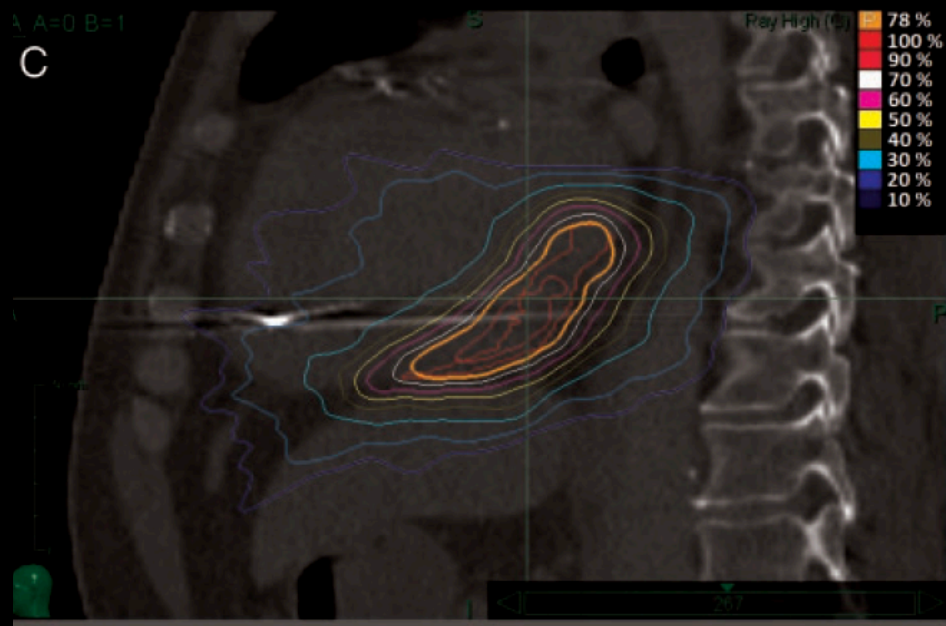


B

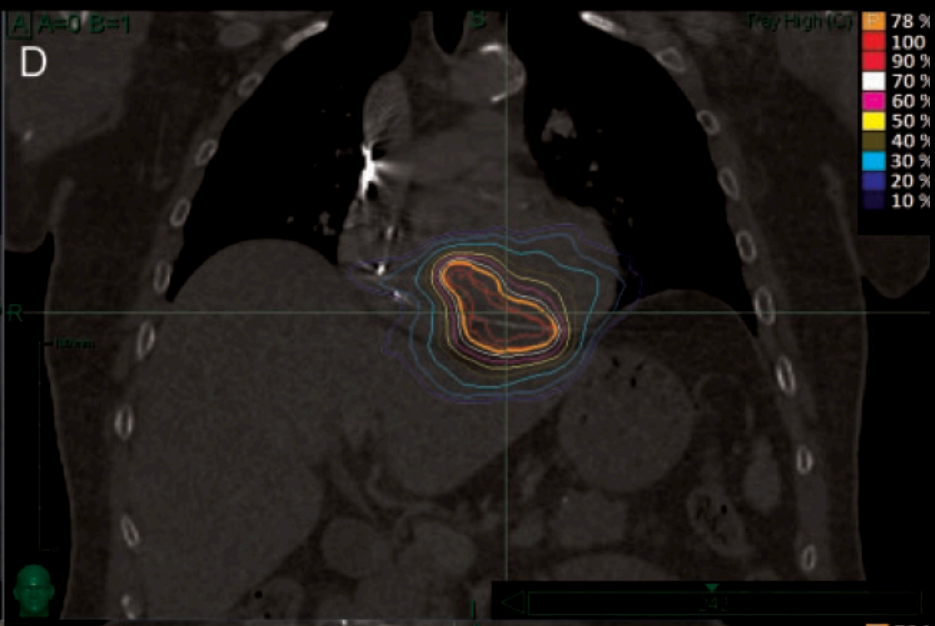


A=0 B=1

C



D



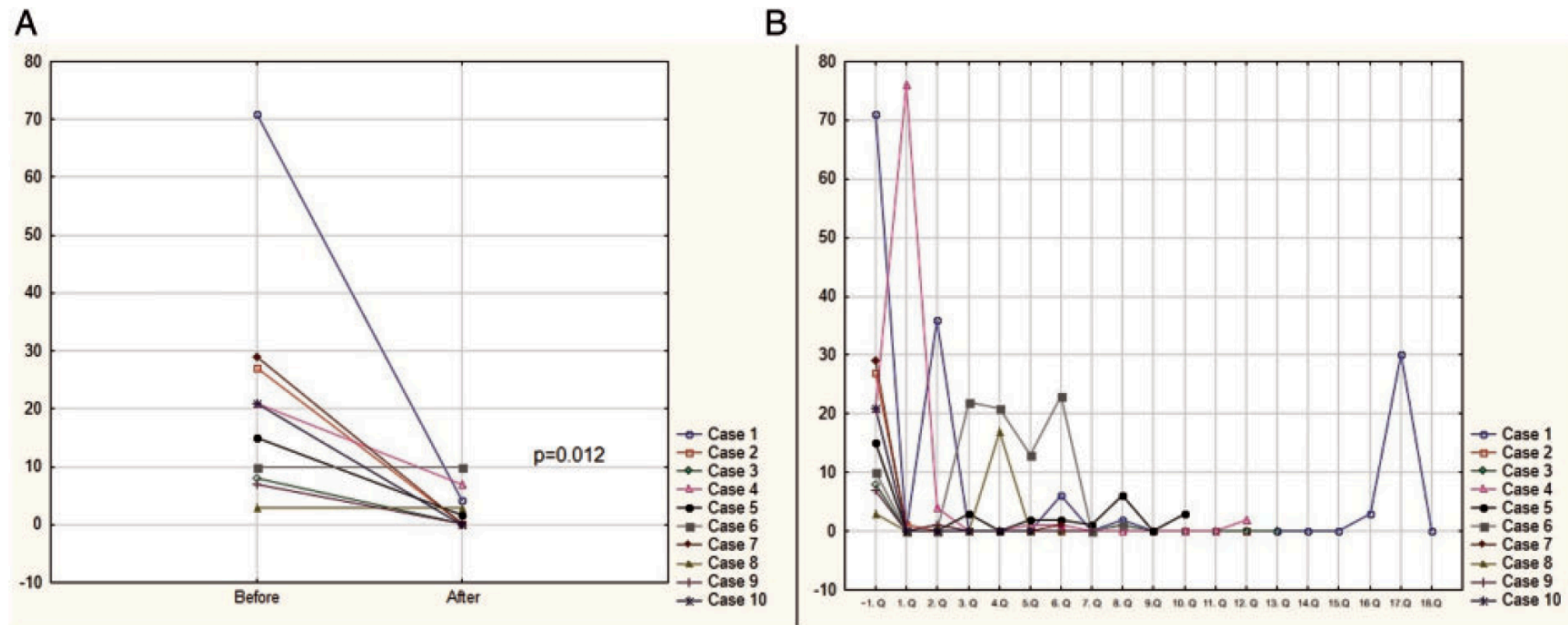
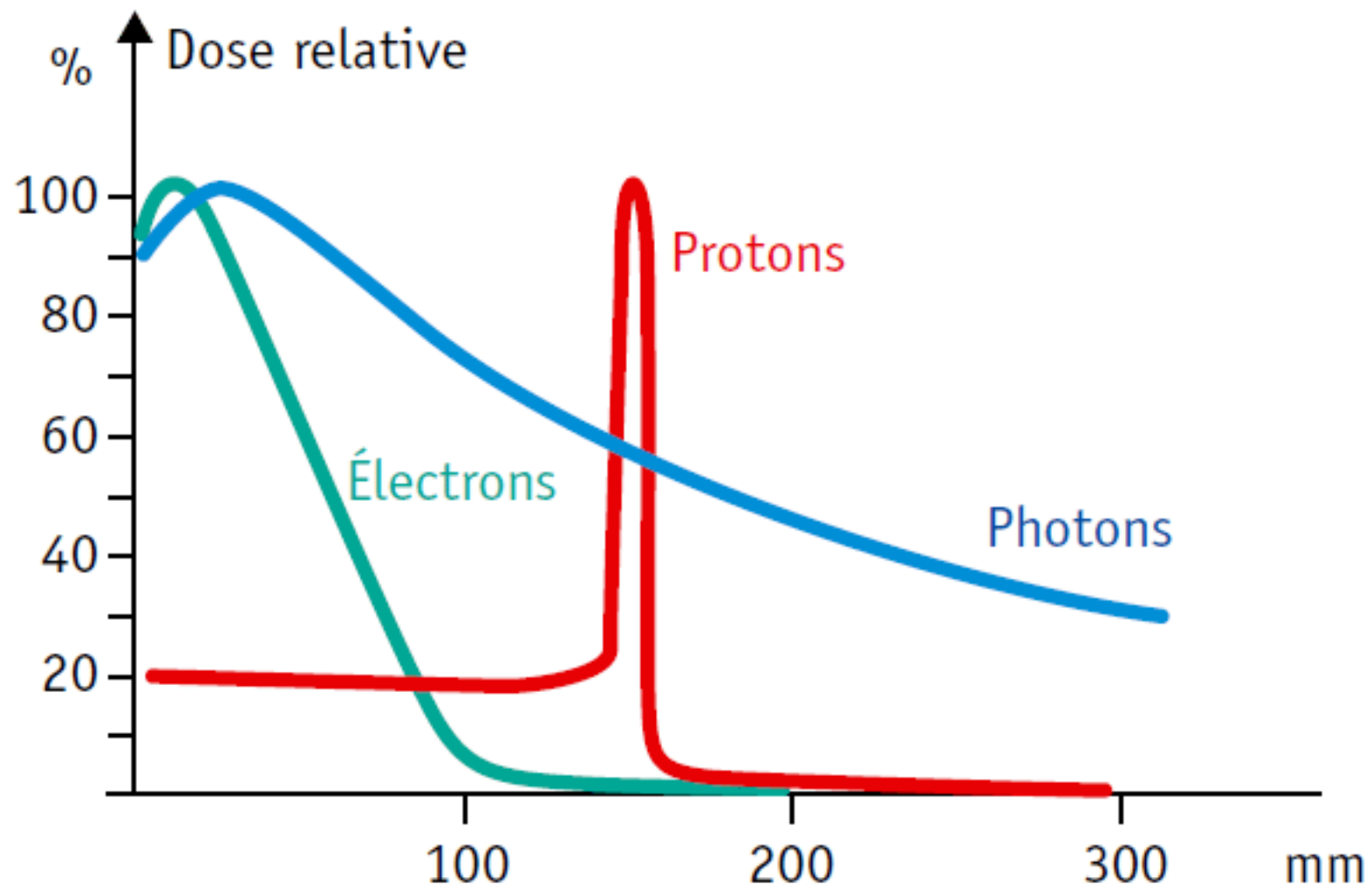


Figure 1 Reduction of sustained VT before and after treatment. (A) Significant reduction of sustained VT after radiosurgery is shown. (B) The total number of episodes of sustained VT in each of the 10 study patients, for three consecutive months before treatment (-1.Q) and continuing for 3 months periods after treatment (1.Q-18.Q) is shown. VT, ventricular tachycardia.

What's new?

- This is case series with the longest follow-up ever on safety and efficacy of stereotactic body radiotherapy in patients with structural heart disease and recurrent ventricular tachycardia (VT).
- Radiotherapy in our patients resulted in a significant decrease of sustained VTs.
- Two our patients showed practically no treatment effect, and in other two patients the effect of radiotherapy was significantly delayed.
- The only acute radiation-related toxicity observed in our study was nausea.
- One possible late cardiac radiation-related toxicity Grade 3 was found 17 months after radiosurgery.



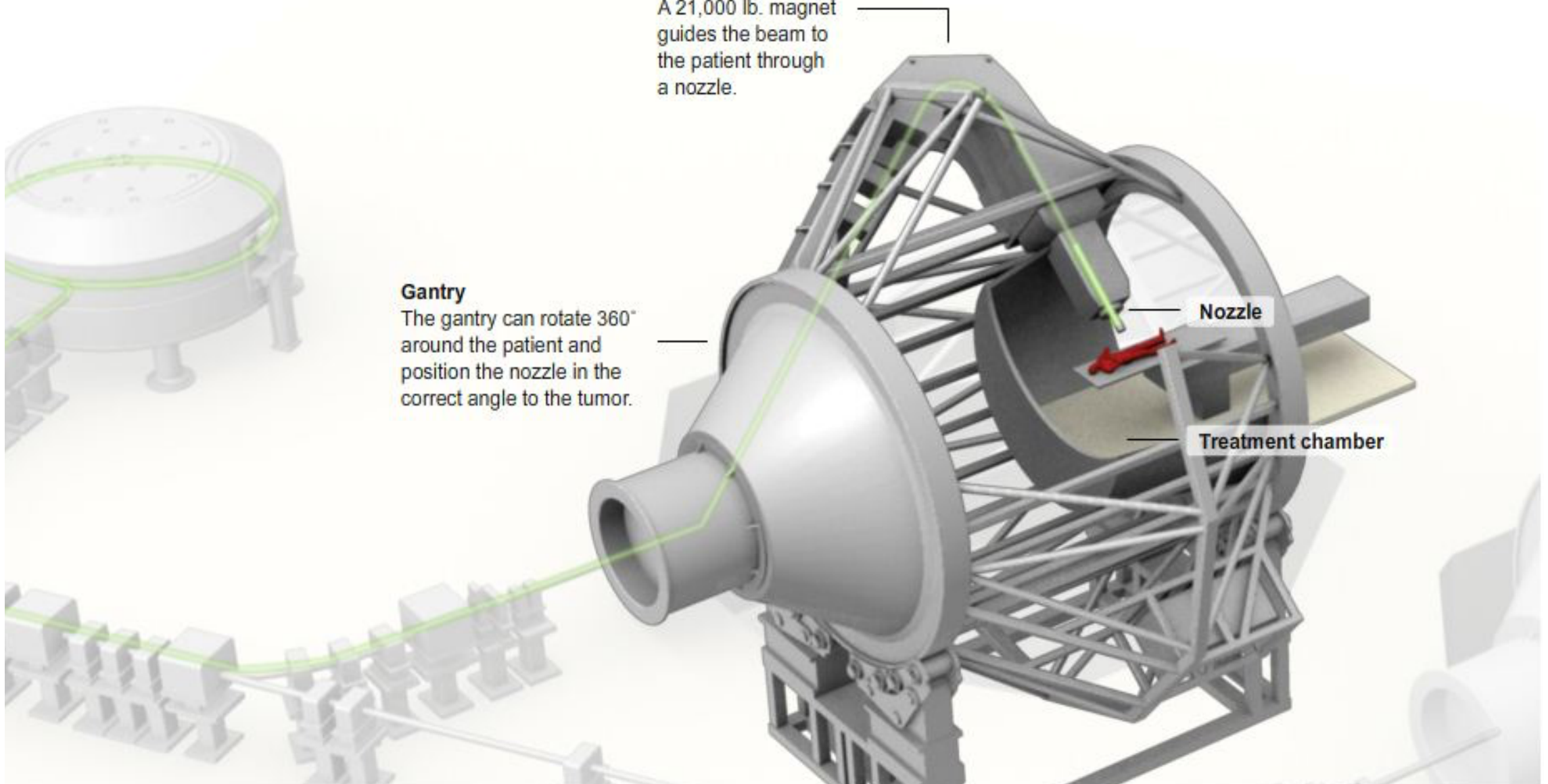
A 21,000 lb. magnet guides the beam to the patient through a nozzle.

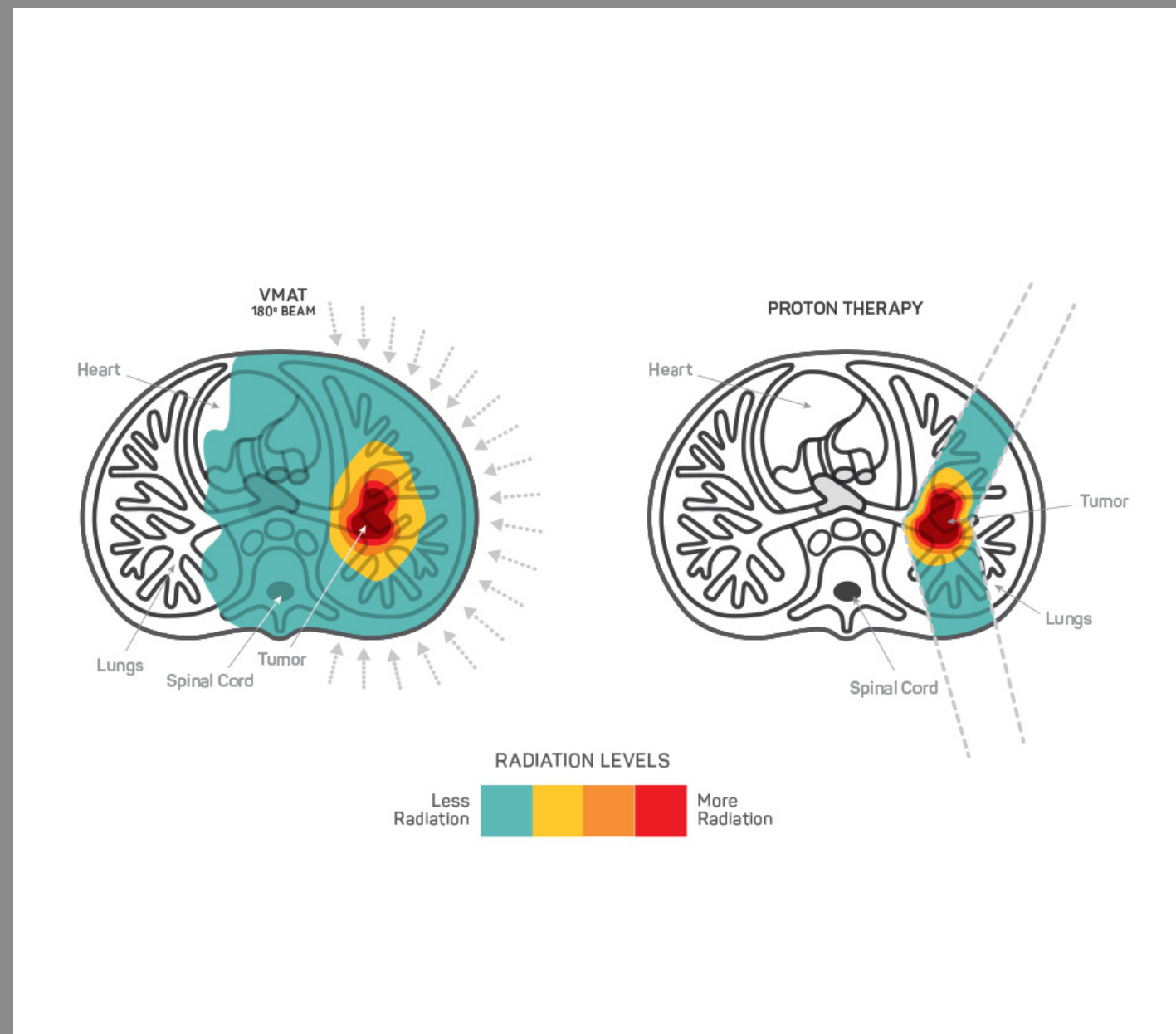
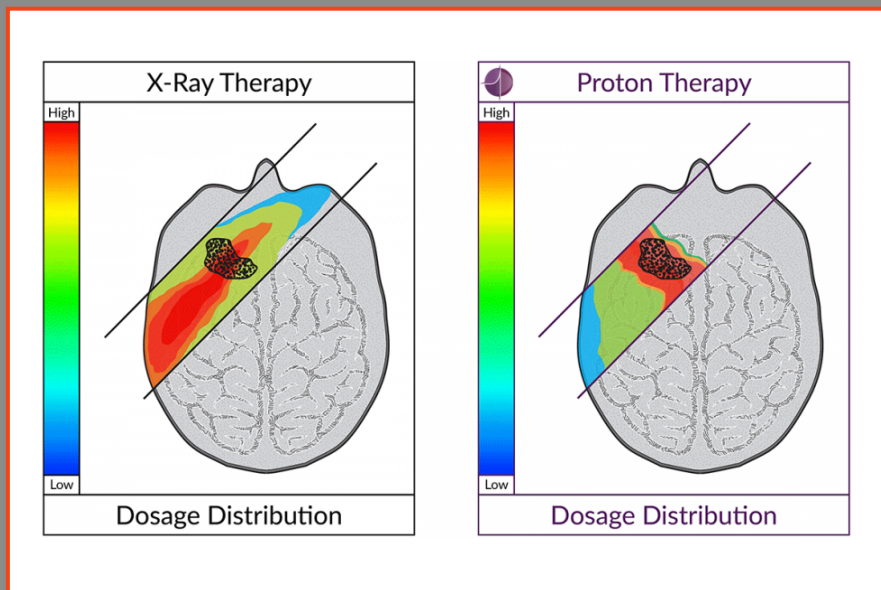
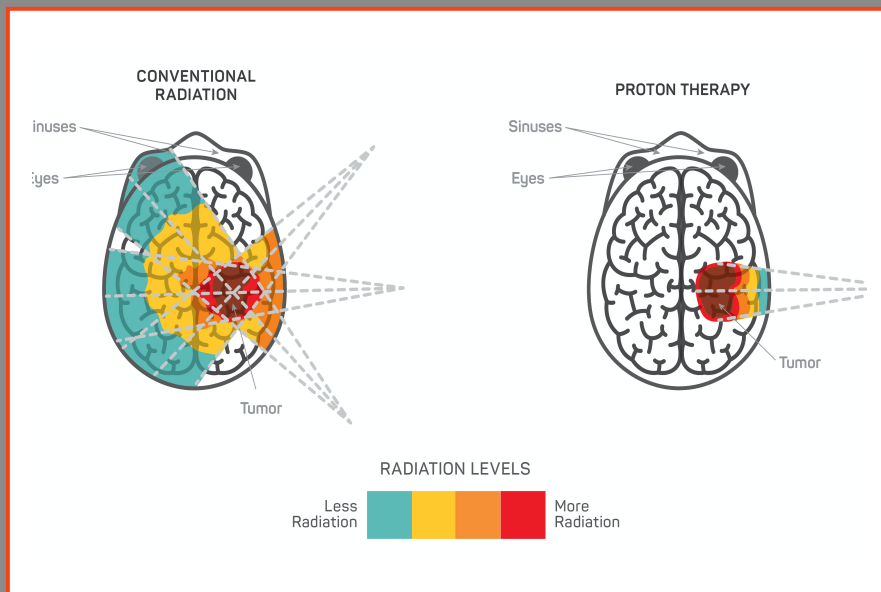
Gantry

The gantry can rotate 360° around the patient and position the nozzle in the correct angle to the tumor.

Nozzle

Treatment chamber







Die Zukunft der VT-Ablation



künstliche Intelligenz

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

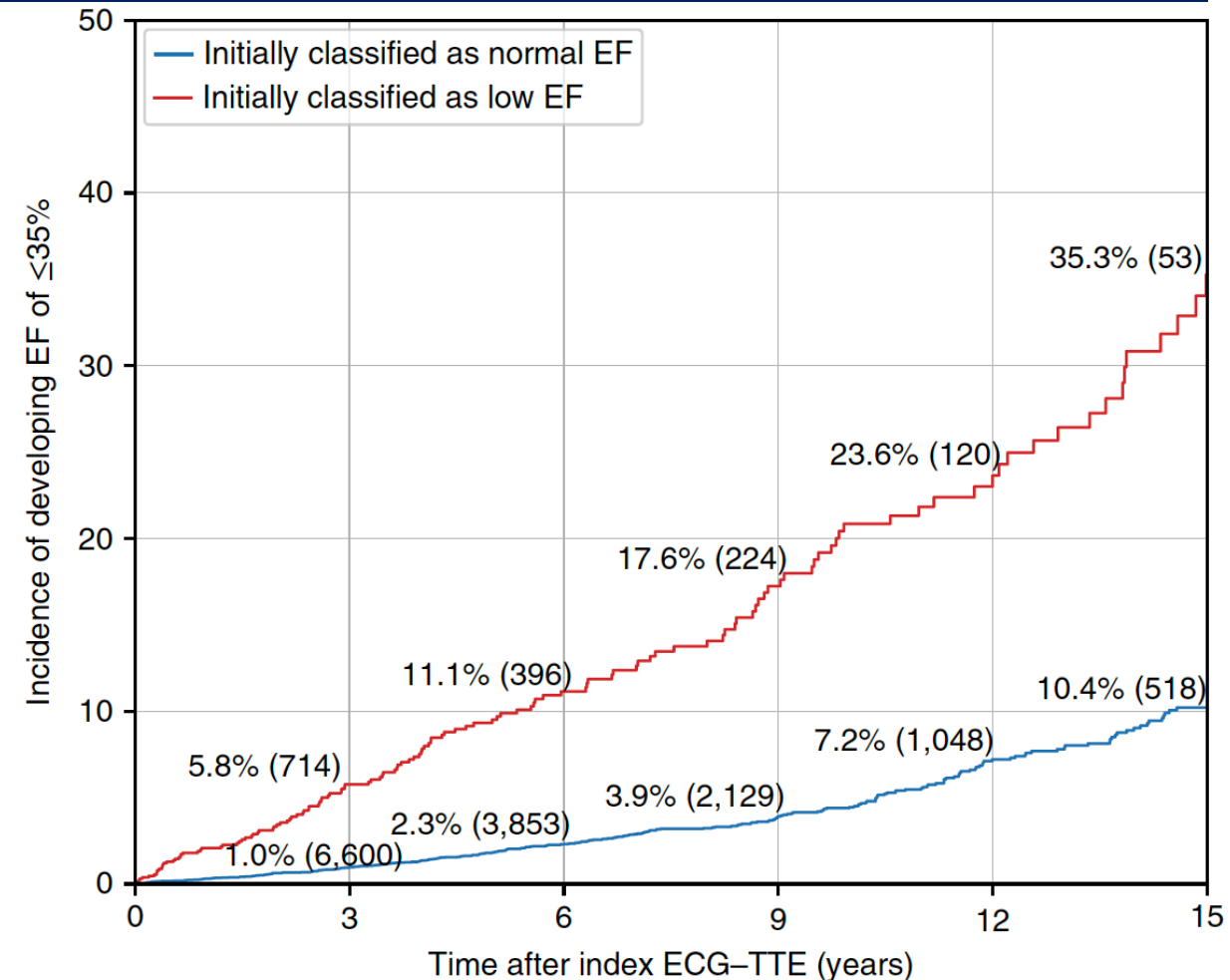
Zachil I. Attia¹, Suraj Kapa¹, Francisco Lopez-Jimenez¹, Paul M. McKie¹, Dorothy J. Ladewig², Gaurav Satam², Patricia A. Pellikka¹, Maurice Enriquez-Sarano¹, Peter A. Noseworthy¹, Thomas M. Munger¹, Samuel J. Asirvatham¹, Christopher G. Scott³, Rickey E. Carter⁴ and Paul A. Friedman^{1*}

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 $\leq 35\%$, 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](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).

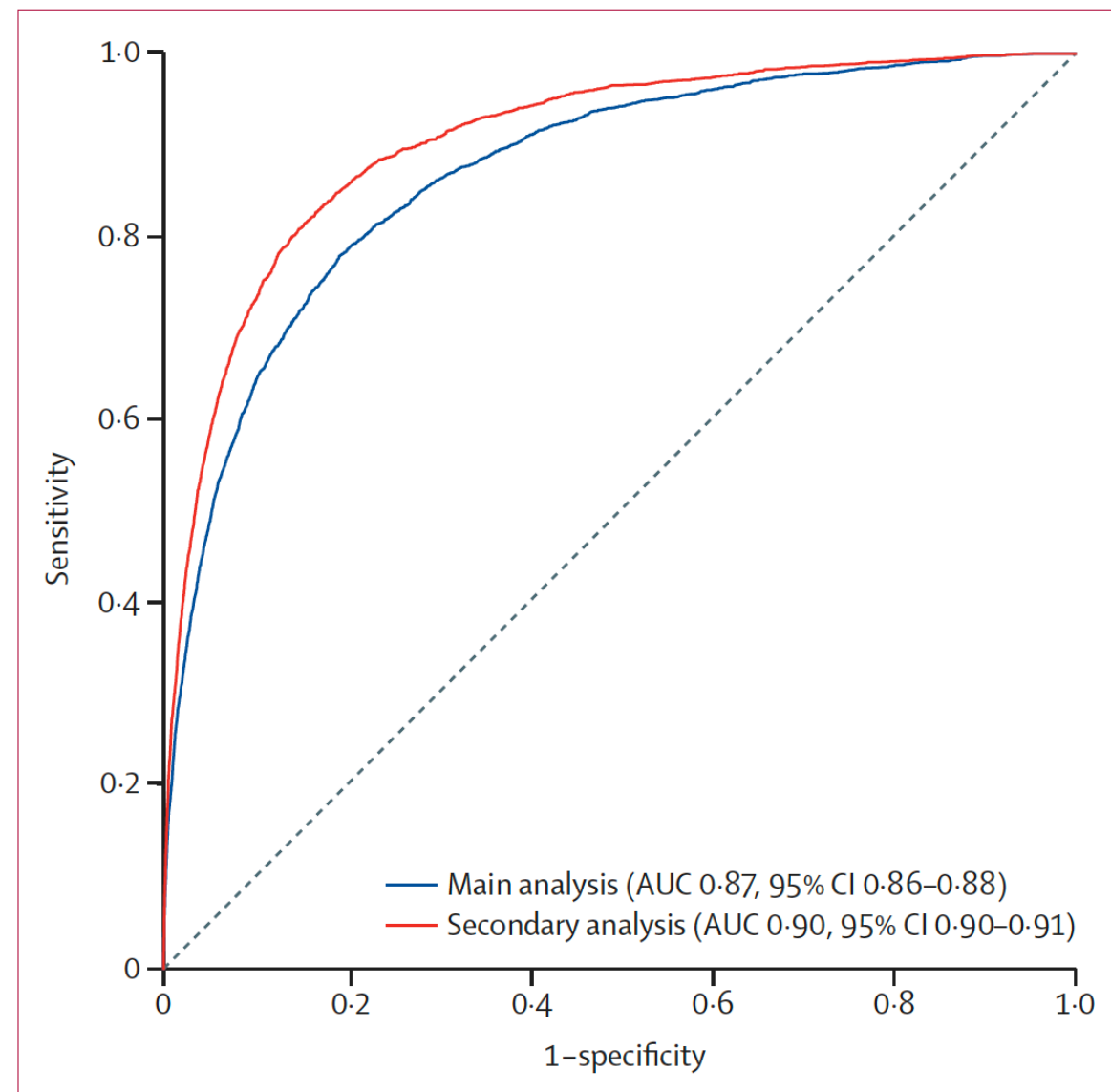


Figure 3: ROC curves for the convolutional neural networks on the testing dataset

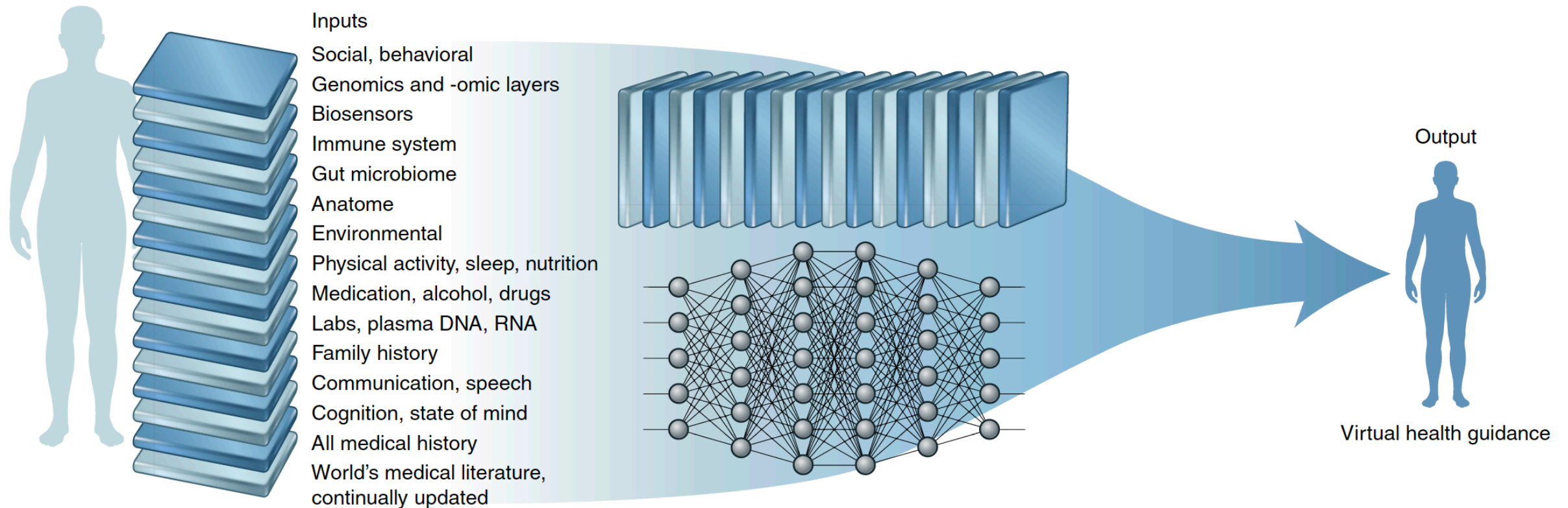


Fig. 3 | The virtual medical coach model with multi-modal data inputs and algorithms to provide individualized guidance. A virtual medical coach that uses comprehensive input from an individual that is deep learned to provide recommendations for preserving the person's health. Credit: Debbie Maizels/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

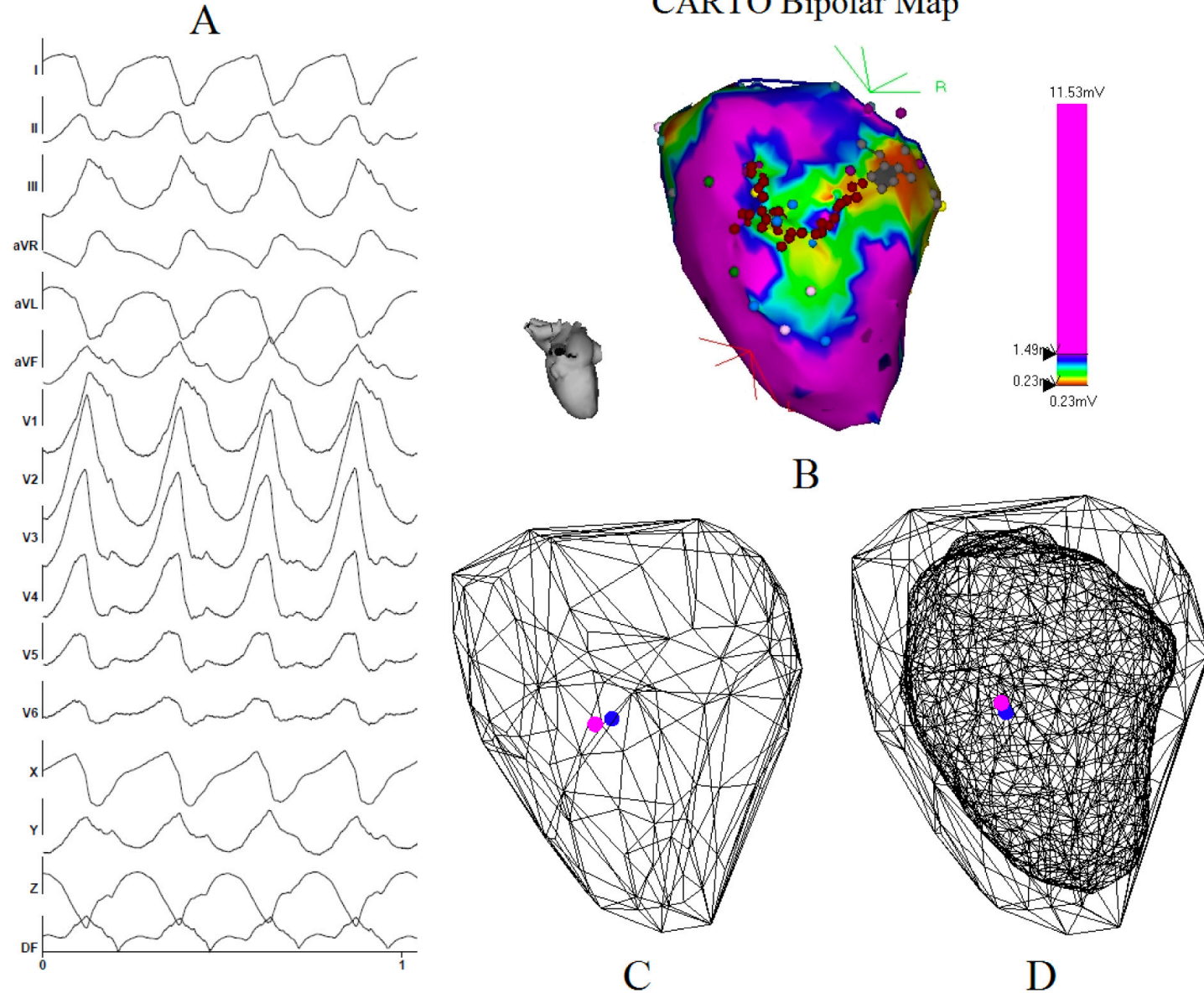
Nature Medicine **volume 25**, pages44–56 (2019)

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,*}

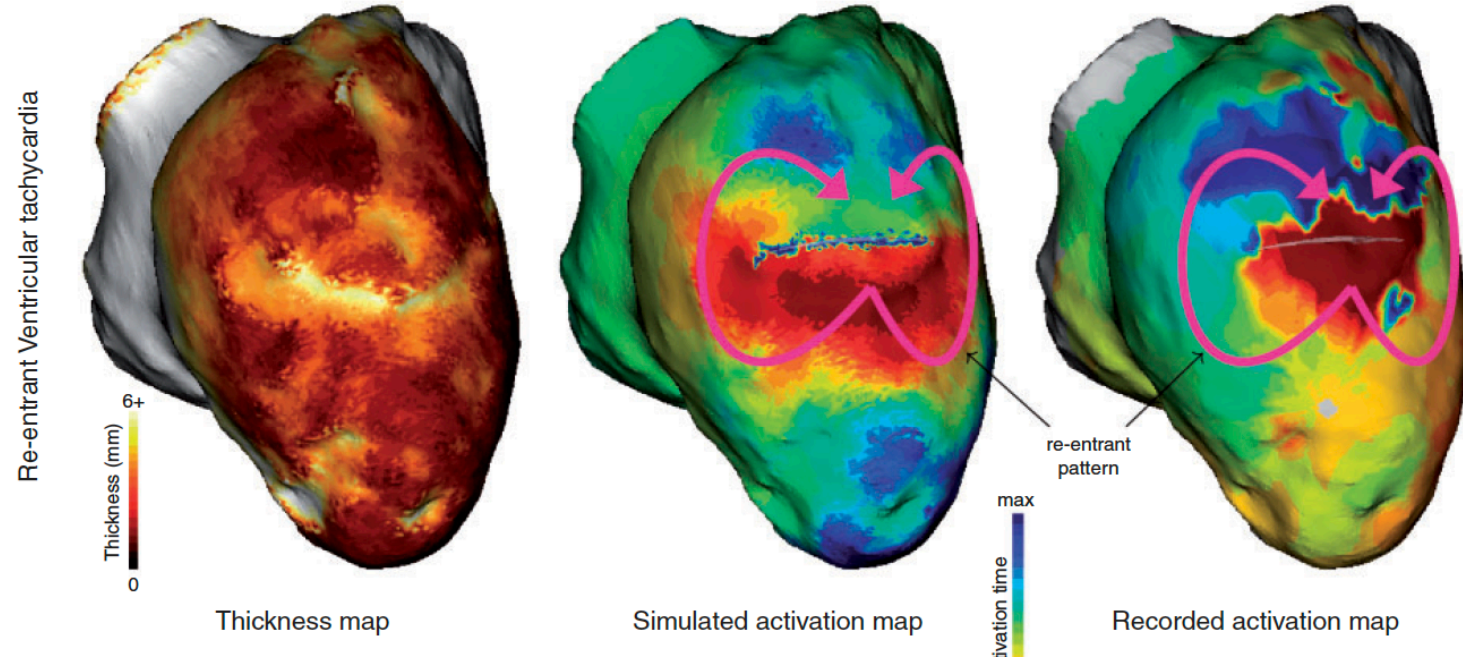
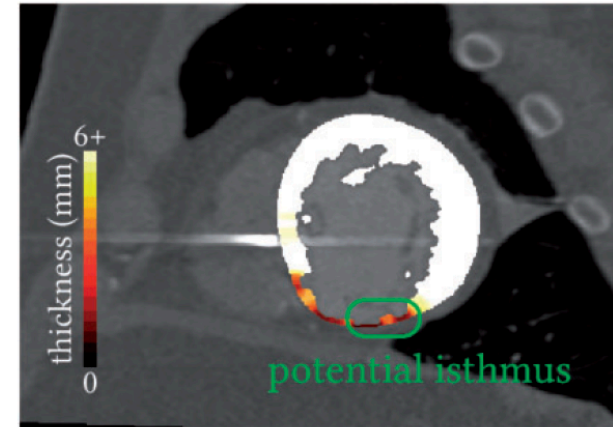
Journal of Electrocardiology. 2019: accepted manuscript

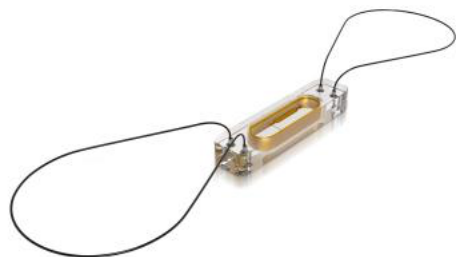
With 10 training pacing sites ...
demonstrated that the automated method
achieved localization error of <5mm for the
VT-exit site



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

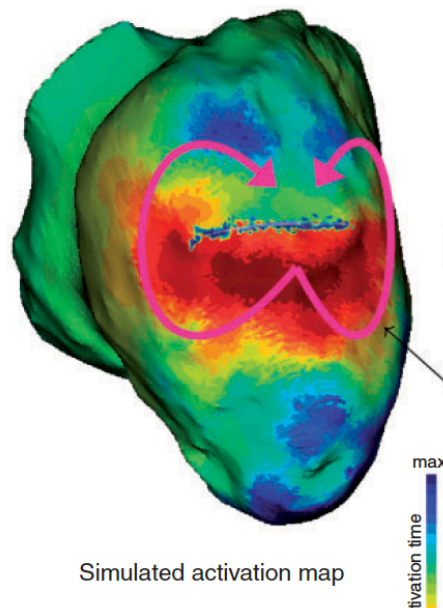
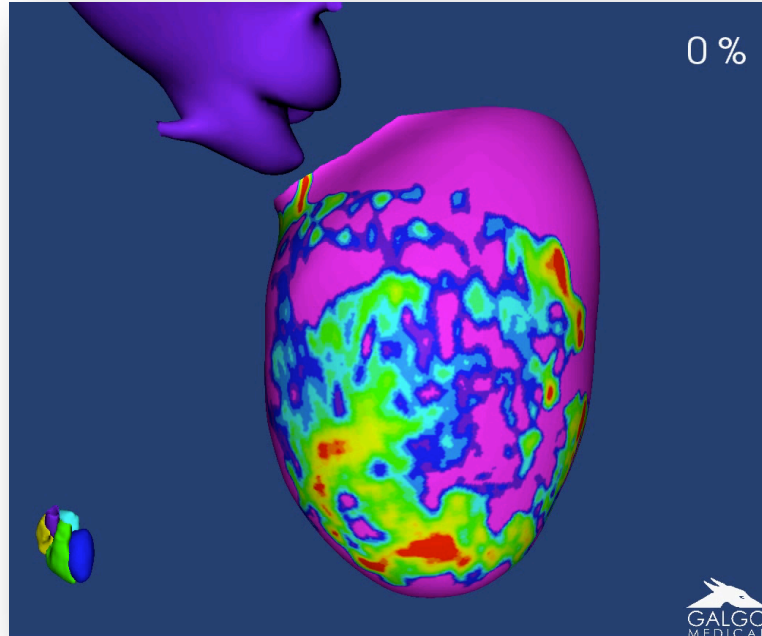
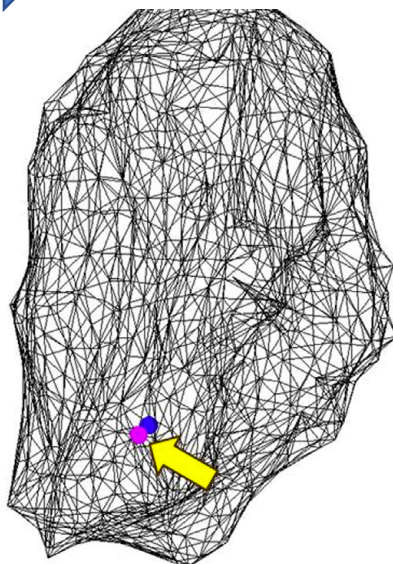
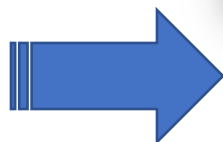
The authors aim at building such a pipeline from computed tomography (CT) images to personalized cardiac electrophysiology (EP) model.





Inputs

Social, behavioral
Genomics and -omic layers
Biosensors
Immune system
Gut microbiome
Anatomy
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





Der beste Weg, die
Zukunft vorherzusagen,
ist, sie zu gestalten.

Peter Drucker