# Stopping the Shocks: Ventricular Tachycardia Ablation

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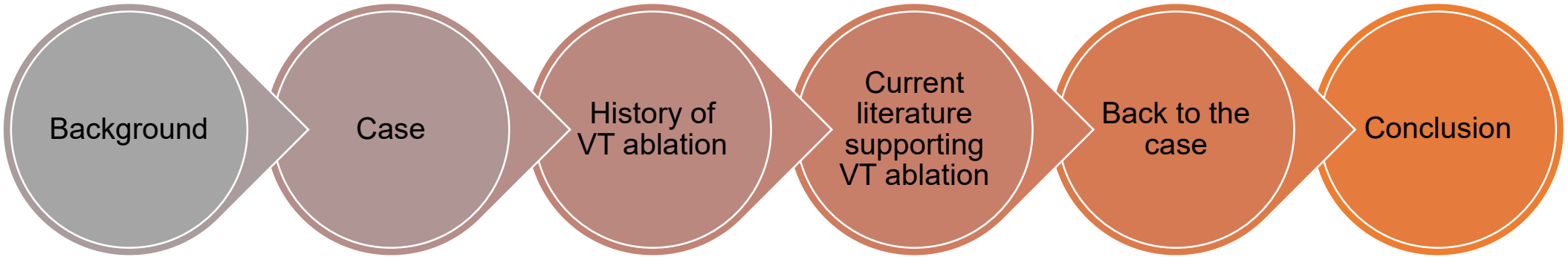
# Goals:

- Review/ understand options for ventricular tachycardia management.

# Conflict of interest :

- Consultant- Biosense Webster


Background
Case
History of VT ablation
Current literature supporting VT ablation
Back to the case
Conclusion

Ventricular arrhythmias are an important cause of morbidity and mortality

They can arise in the form of single premature ventricular complexes to sustained ventricular tachycardia and fibrillation

Rapid developments have taken place over the past decade in our understanding of these arrhythmias, and our ability to diagnose and treat them.

# Case

- 28-year-old male who had a syncopal episode when he was 21 years old while playing basketball.
- He had another episode of syncope when he was 23 years old.
- After extensive cardiac work up, he was found to have *non-ischemic dilated cardiomyopathy*.
- Ejection fraction was 20-25%.

# Next step

A. Consider anti arrhythmic medications

B. Consider guideline directed medical therapy

C. Consider an ICD implant

D. All of the above

E. Consider all the above as well as ablation procedure.

Started on GDMT and received  an ICD.

Received 3 ICD shocks at age 24 and was started on Sotalol however, had additional shocks.

ECHO at the time showed LV thrombus so endocardial ablation could not be performed.

An epicardial ablation was performed at an outside hospital and was discharged on higher doses of Sotalol.

Did well for a few months before additional ICD shocks and was switched from Sotalol to Dofetilide (500 mcg every 12 hrs).

Did well till age 27 before started having shocks again(16 shocks in a span of 2 weeks).

# What’s the next best step…

A. Increase Dofetilide dose

B. Add a second antiarrhythmic agent

C. Consider ablation.

D. Consider transplant.

E. Consider sympathetic ganglion block.

- 1956

- Early to mid 70s

**Cardiac Aneurysm with Ventricular Tachycardia and Subsequent Excision of Aneurysm**

**Case Report**

*By* O. A. Couch, Jr., M.D.

*Circulation, Volume XX, August 1959*

Relative efficacy of blind left ventricular aneurysm resection for the treatment of recurrent ventricular tachycardia

Jay W. Mason MD, FACC, Edward B. Stinson MD, FACC, Roger A. Winkle MD, FACC, Philip E. Oyer MD, PhD, Jerry C. Griffin MD, FACC, David L. Ross MB, FRACP

The American Journal of Cardiology

Volume 49, Issue 1, January 1982, Pages 241-248

- **Late 70s to early 80s**

Encircling Endocardial Ventriculotomy: A New Surgical Treatment for Life-Threatening Ventricular Tachycardias Resistant to Medical Treatment Following Myocardial Infarction

Gerard Guiraudon M.D., Guy Fontaine M.D., Robert Frank M.D., Georges Escande M.D., Philippe Etievent M.D., Christian Cabrol M.D.

The Annals of Thoracic Surgery
Volume 26, Issue 5, November 1978, Pages 438-444

**Total Disconnection of the Right Ventricular Free Wall: Surgical Treatment of Right Ventricular Tachycardia Associated with Right Ventricular Dysplasia**

GERARD M. GUIRAUDON, M.D., GEORGE J. KLEIN, M.D., SAJAD S. GULAMHUSEIN, M.D., GEORGES A. PAINVIN, M.D., CARLOS DEL CAMPO, M.D., JOSE C. GONZALES, M.D., AND PATRICK T. KO, M.D.

**Circulation 67, No. 2, 1983.**

- 1983

- 1990s

## Electrode Catheter Ablation of Refractory Focal Ventricular Tachycardia

GEOFFREY O. HARTZLER, MD, FACC

*Kansas City, Missouri*

JACC Vol 2, No. 6
December 1983.1107–13

## Radiofrequency Catheter Ablation of Ventricular Tachycardia in Patients Without Structural Heart Disease

Lawrence S. Klein, MD; Hue-Teh Shih, MD; F. Kevin Hackett, MD;
Douglas P. Zipes, MD; and William M. Miles, MD

**Circulation** *Vol 85, No 5 May 1992*

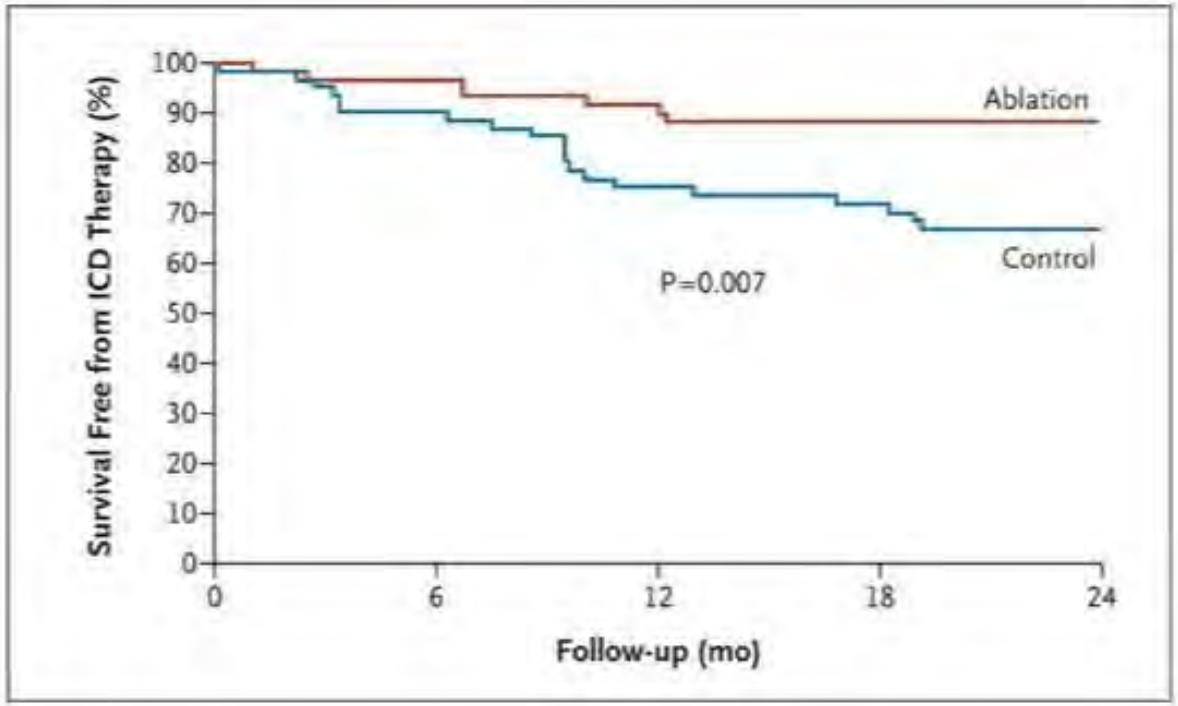
**2000-2020**

Several multicenter randomized control trials in catheter ablation of VT in ischemic cardiomyopathy patients

# SMASH-VT

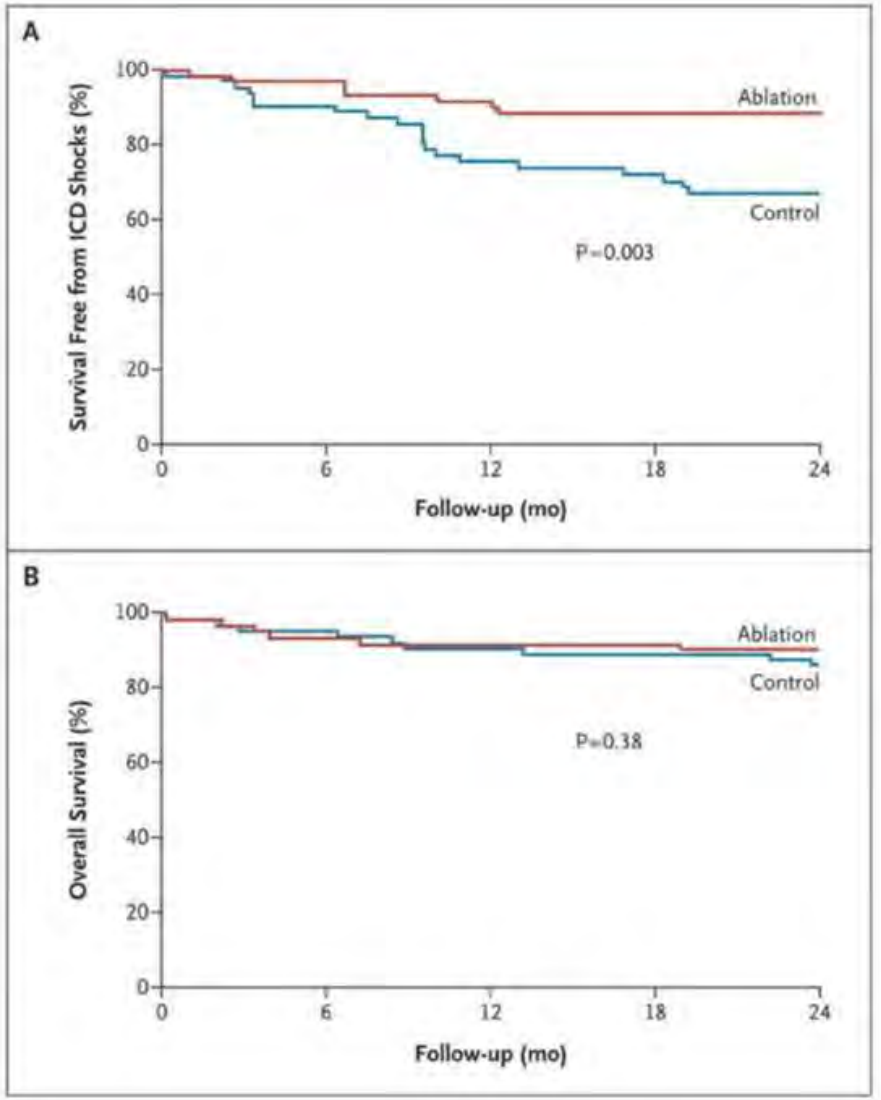
## Prophylactic Catheter Ablation for the Prevention of Defibrillator Therapy

Vivek Y. Reddy, M.D., Matthew R. Reynolds, M.D., Petr Neuzil, M.D., Ph.D., Allison W. Richardson, M.D., Milos Taborsky, M.D., Ph.D., Krit Jongnarangsin, M.D., Stepan Kralovec, Lucie Sediva, M.D., Jeremy N. Ruskin, M.D., and Mark E. Josephson, M.D.




N Engl J Med 2007; 357:2657-2665

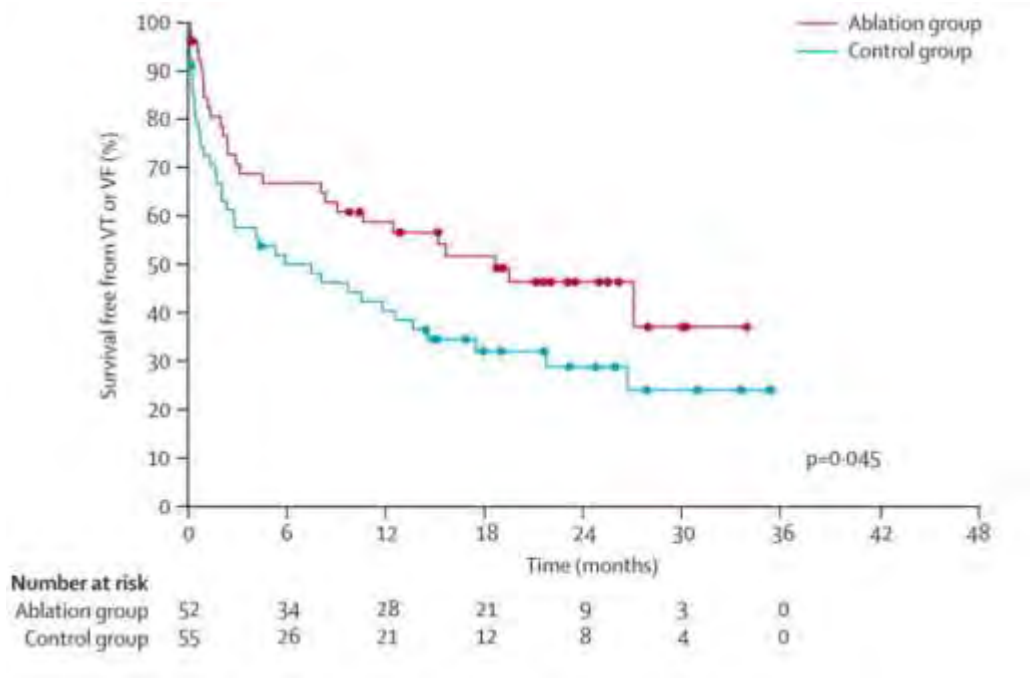
# SMASH-VT


A
Survival Free from ICD Shocks (%)
100
80
60
40
20
0
Ablation
Control
P=0.003
0
6
12
18
24
Follow-up (mo)
B
Overall Survival (%)
100
80
60
40
20
0
Ablation
Control
P=0.38
0
6
12
18
24
Follow-up (mo)

# VTACH

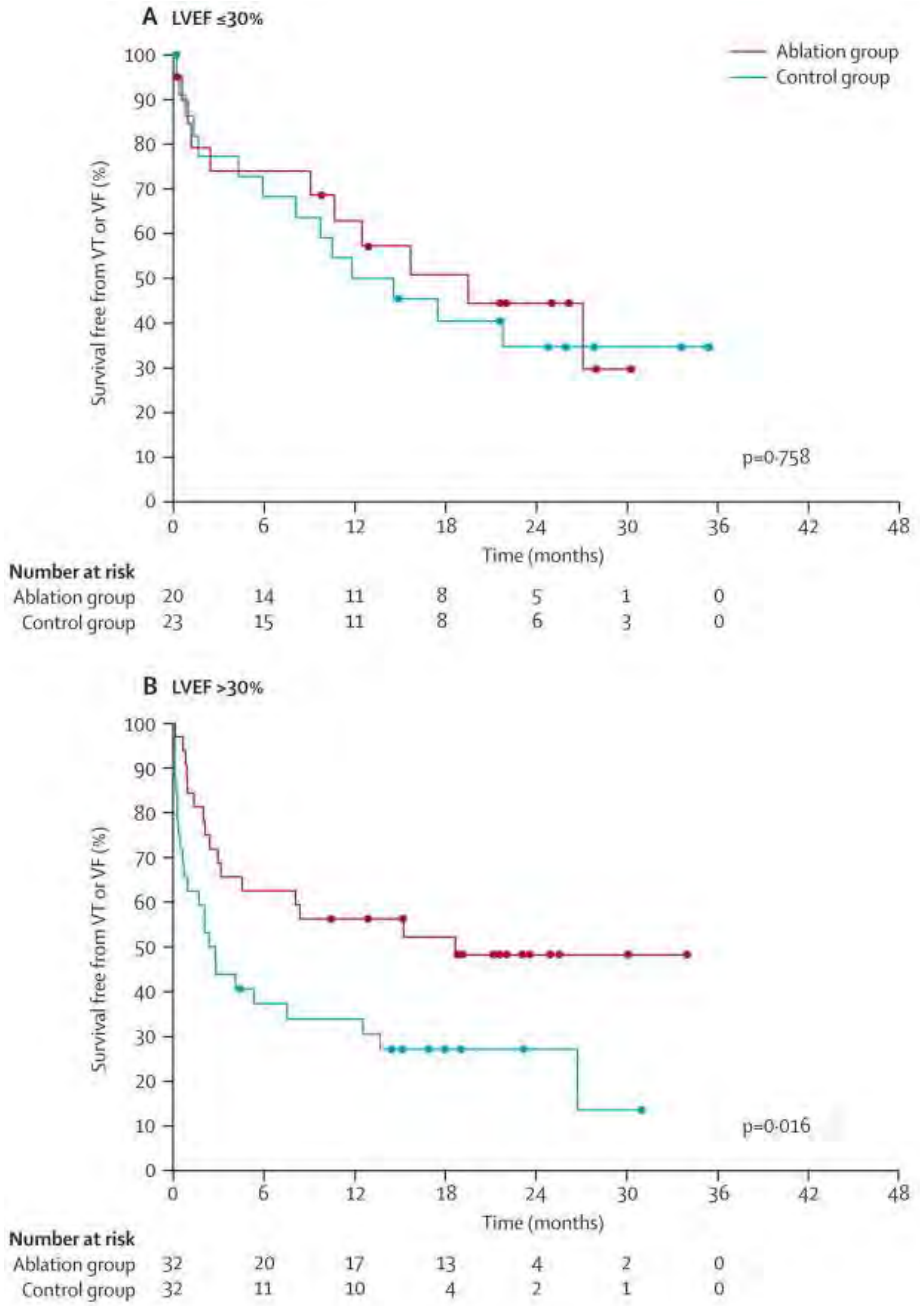
## Catheter ablation of stable ventricular tachycardia before defibrillator implantation in patients with coronary heart disease (VTACH): a multicentre randomised controlled trial

Karl-Heinz Kuck [1], Anselm Schaumann, Lars Eckardt, Stephan Willems, Rodolfo Ventura, Etienne Delacrétaz, Heinz-Friedrich Pitschner, Josef Kautzner, Burghard Schumacher, Peter S Hansen; VTACH study group

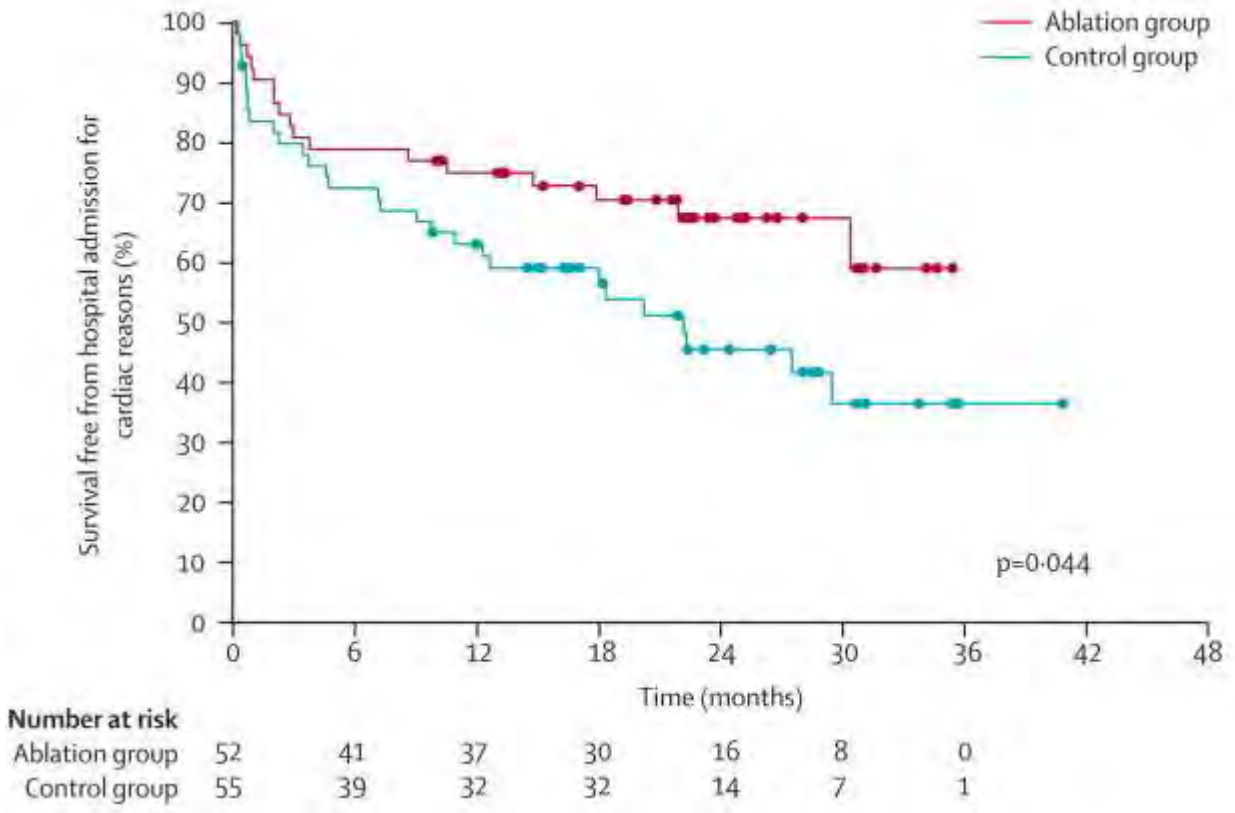



Lancet. 2010 Jan 2;375(9708):31-40.

# VTACH


A LVEF ≤30%
Ablation group
Control group
Survival free from VT or VF (%)
100
90
80
70
60
50
40
30
20
10
0
p=0·758
0
6
12
18
24
30
36
42
48
Time (months)
Number at risk
Ablation group 20 14 11 8 5 1 0
Control group 23 15 11 8 6 3 0
B LVEF >30%
Survival free from VT or VF (%)
p=0·016
Time (months)
Number at risk
Ablation group 32 20 17 13 4 2 0
Control group 32 11 10 4 2 1 0

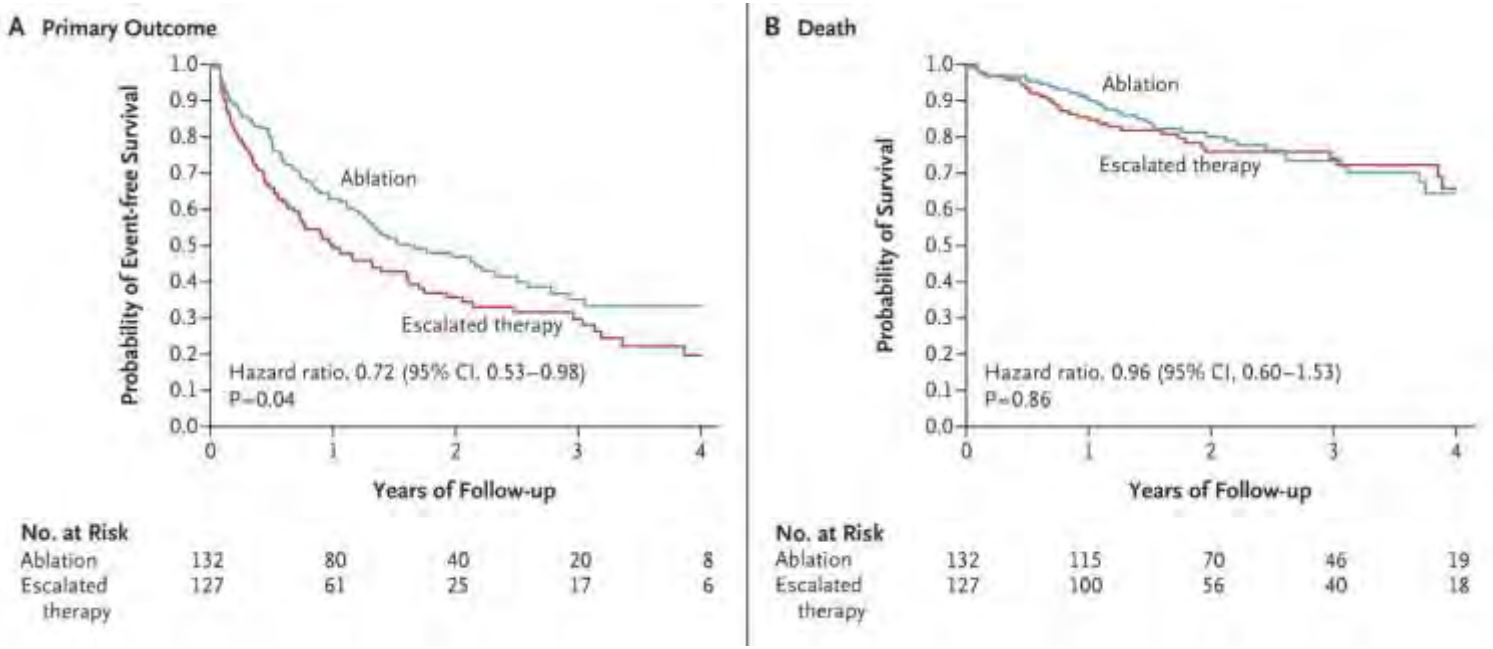
# VTACH


Ablation group
Control group
Survival free from hospital admission for cardiac reasons (%)
100
90
80
70
60
50
40
30
20
10
0
p=0·044
0
6
12
18
24
30
36
42
48
Time (months)
Number at risk
Ablation group 52 41 37 30 16 8 0
Control group 55 39 32 32 14 7 1

# VANISH trial

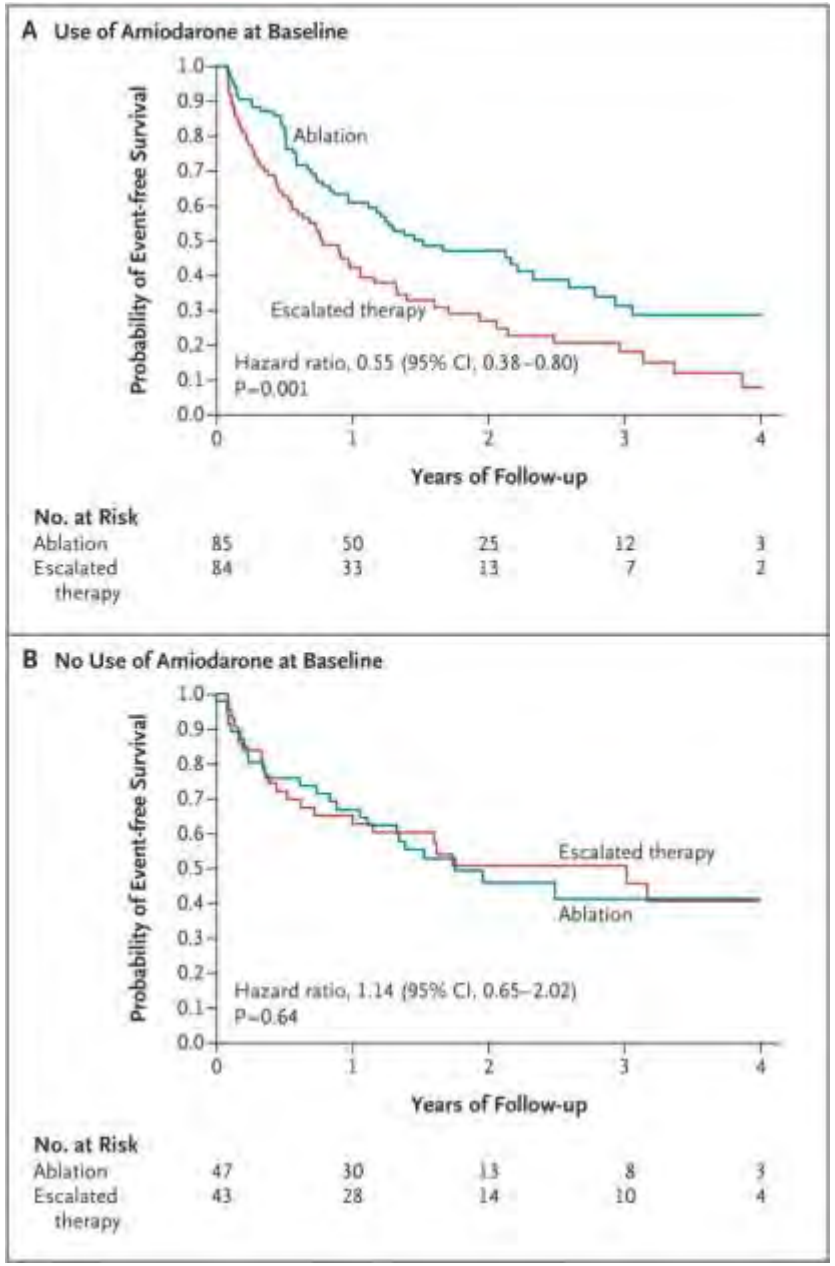
## Ventricular Tachycardia Ablation versus Escalation of Antiarrhythmic Drugs

John L. Sapp, M.D., George A. Wells, Ph.D., Ratika Parkash, M.D., William G. Stevenson, M.D., Louis Blier, M.D., Jean-Francois Sarrazin, M.D., Bernard Thibault, M.D., Lena Rivard, M.D., Lorne Gula, M.D., Peter Leong-Sit, M.D., Vidal Essebag, M.D., Ph.D., Pablo B. Nery, M.D., et al.




N Engl J Med 2016; 375:111-121

# VANISH trial



SMS

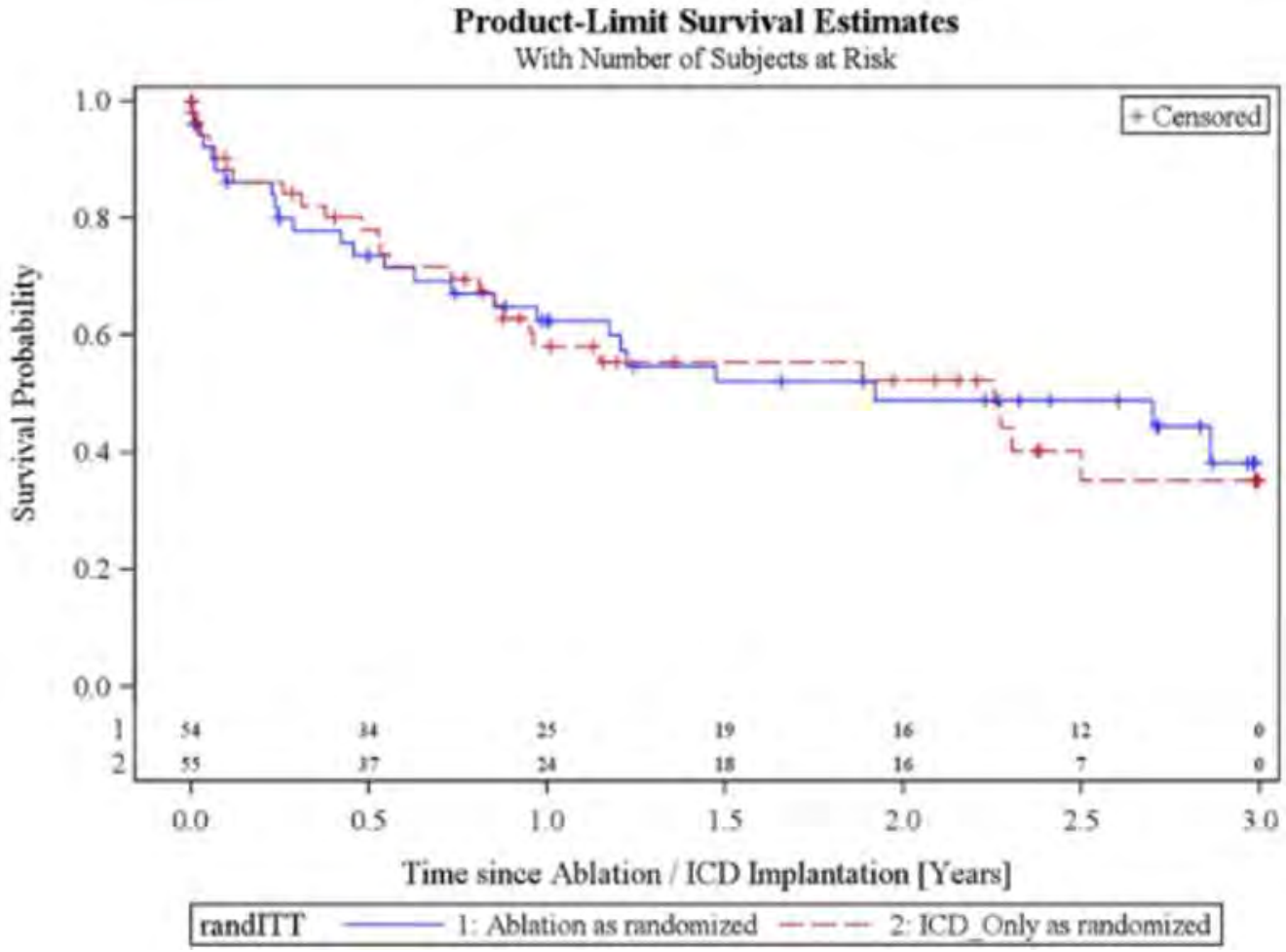
# Impact of Substrate Modification by Catheter Ablation on Implantable Cardioverter–Defibrillator Interventions in Patients With Unstable Ventricular Arrhythmias and Coronary Artery Disease

## Results From the Multicenter Randomized Controlled SMS (Substrate Modification Study)

Karl-Heinz Kuck, MD, Roland Richard Tilz, MD, Thomas Deneke, MD, Boris A. Hoffmann, MD, Rodolfo Ventura, MD, Peter Steen Hansen, MD, Markus Zarse, MD, Stefan H. Hohnloser, MD, Josef Kautzner, MD, Stephan Willems, MD, and for the SMS Investigators

Circulation: Arrhythmia and Electrophysiology
Volume 10, Issue 3, March 2017

# SMS


Product-Limit Survival Estimates
With Number of Subjects at Risk
+ Censored
Survival Probability
1.0
0.8
0.6
0.4
0.2
0.0
1 54 34 25 19 16 12 0
2 55 37 24 18 16 7 0
0.0 0.5 1.0 1.5 2.0 2.5 3.0
Time since Ablation / ICD Implantation [Years]
randITT 1: Ablation as randomized 2: ICD_Only as randomized

# BERLIN VT

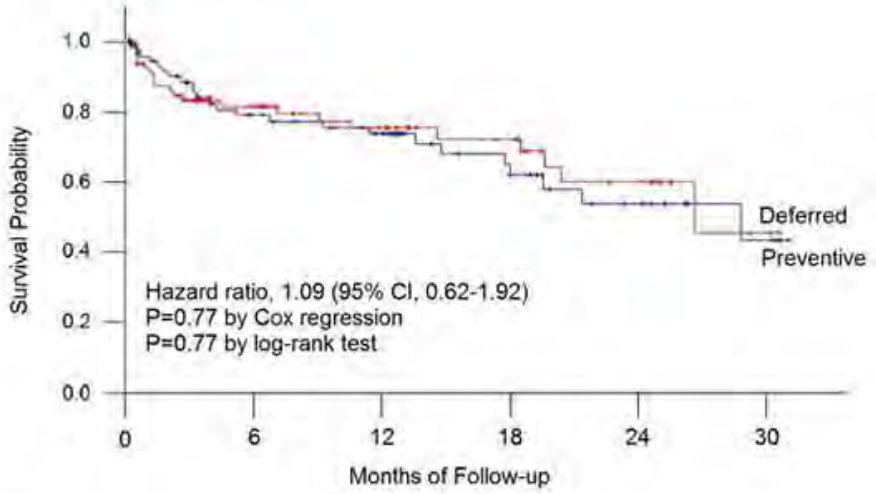
## Preventive or Deferred Ablation of Ventricular Tachycardia in Patients With Ischemic Cardiomyopathy and Implantable Defibrillator (BERLIN VT)

### A Multicenter Randomized Trial

Stephan Willems, Roland Richard Tilz, Daniel Steven, Stefan Kääb, Karl Wegscheider, László Gellér, Christian Meyer, Christian-Hendrik Heeger, Andreas Metzner, Moritz F. Sinner, Michael Schlüter, Peter Nordbeck, Lars Eckardt, Harilaos Bogossian, Arian Sultan, Beate Wenzel and Karl-Heinz Kuck
and the BERLIN VT Investigators

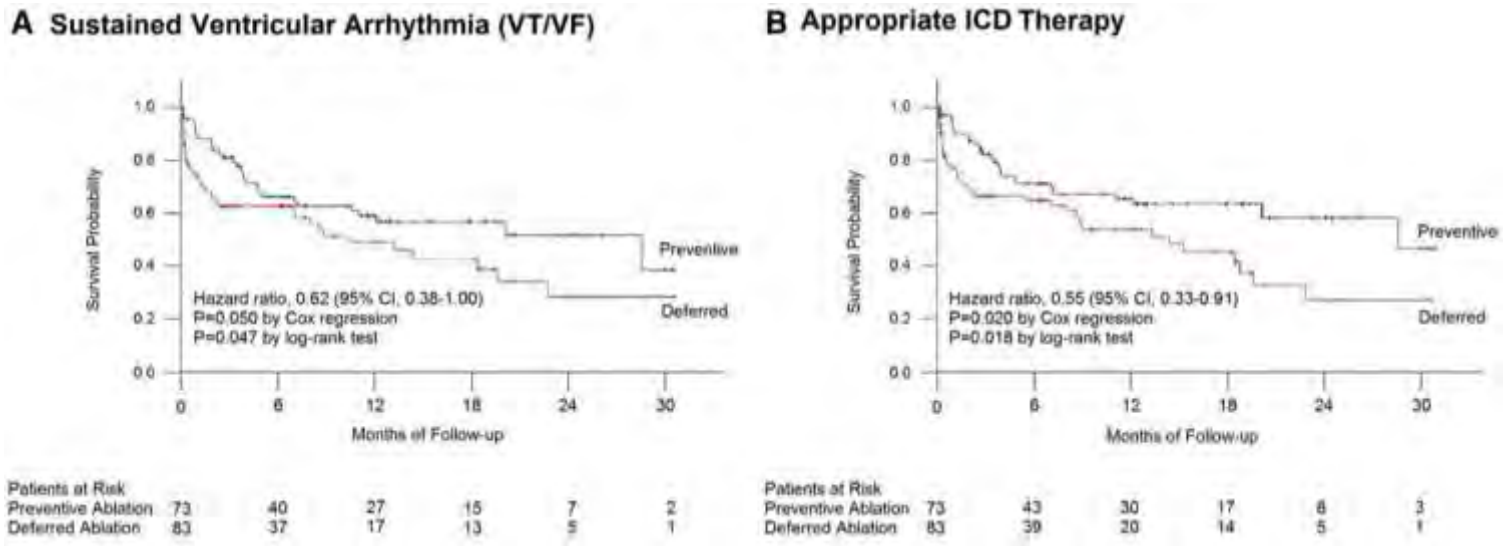
Originally published 31 Jan 2020 | https://doi.org/10.1161/CIRCULATIONAHA.119.043400 | Circulation. 2020;141:1057–1067

**A Primary Endpoint**




| Patients at Risk | | | | | | |
|---|---|---|---|---|---|---|
| Preventive Ablation | 76 | 45 | 35 | 19 | 10 | 4 |
| Deferred Ablation | 83 | 48 | 30 | 22 | 12 | 2 |

# BERLIN VT


A Sustained Ventricular Arrhythmia (VT/VF)
Survival Probability
1.0
0.8
0.6
0.4
0.2
0.0
Hazard ratio, 0.62 (95% CI, 0.38-1.00)
P=0.050 by Cox regression
P=0.047 by log-rank test
Preventive
Deferred
0
6
12
18
24
30
Months of Follow-up
Patients at Risk
Preventive Ablation 73 40 27 15 7 2
Deferred Ablation 83 37 17 13 5 1
B Appropriate ICD Therapy
Survival Probability
1.0
0.8
0.6
0.4
0.2
0.0
Hazard ratio, 0.55 (95% CI, 0.33-0.91)
P=0.020 by Cox regression
P=0.018 by log-rank test
Preventive
Deferred
0
6
12
18
24
30
Months of Follow-up
Patients at Risk
Preventive Ablation 73 43 30 17 8 3
Deferred Ablation 83 39 20 14 5 1

# What’s the next best step…

A. Increase Dofetilide dose

B. Add a second antiarrhythmic agent

C. Consider ablation.

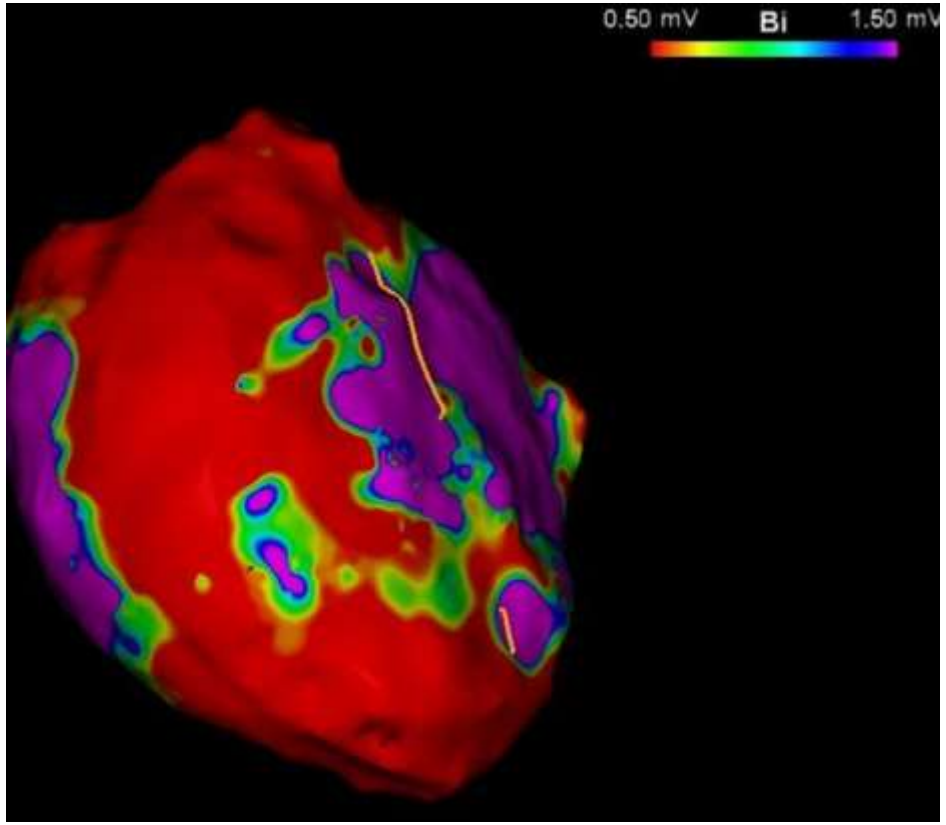
D. Consider transplant.

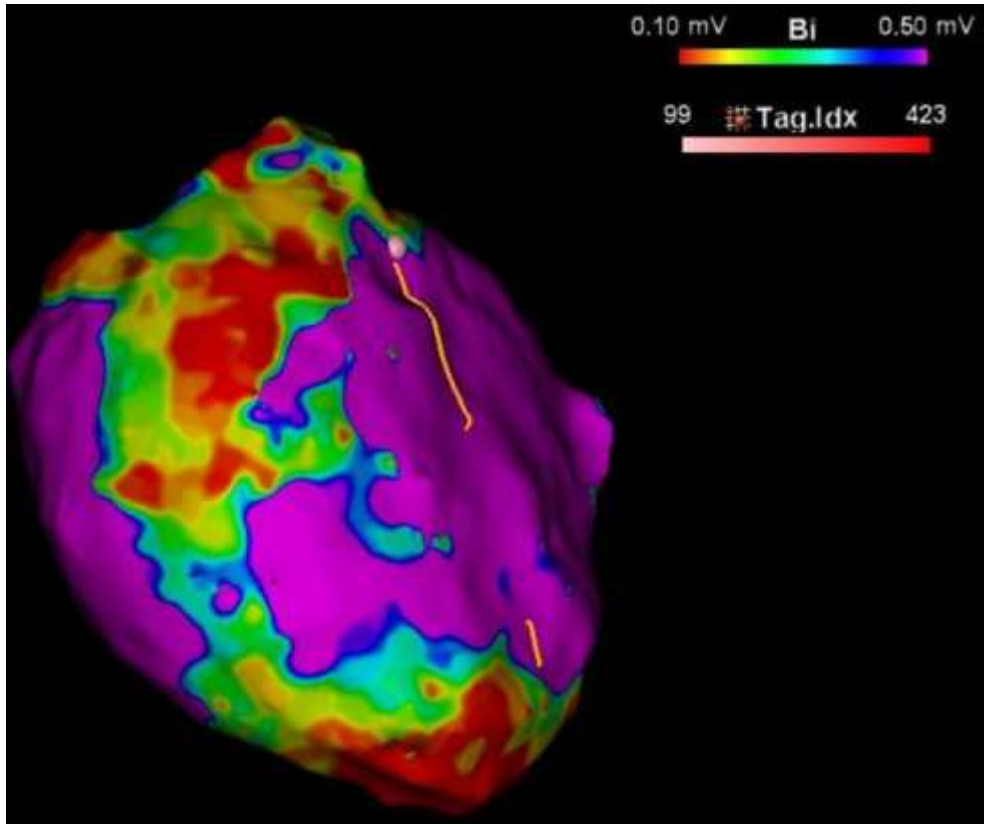
E. Consider sympathetic ganglion block.

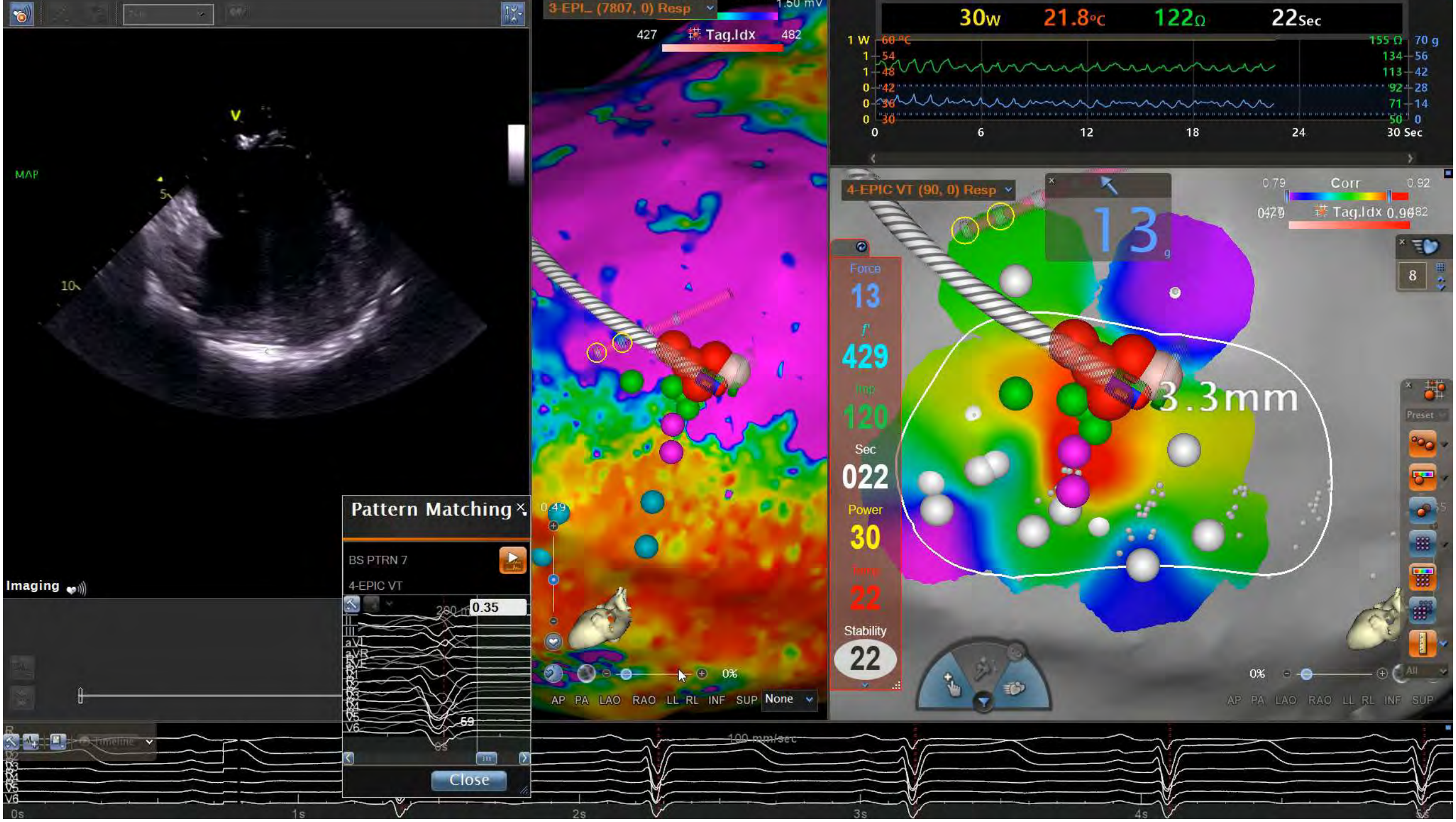
Back to our Case (at age 27):

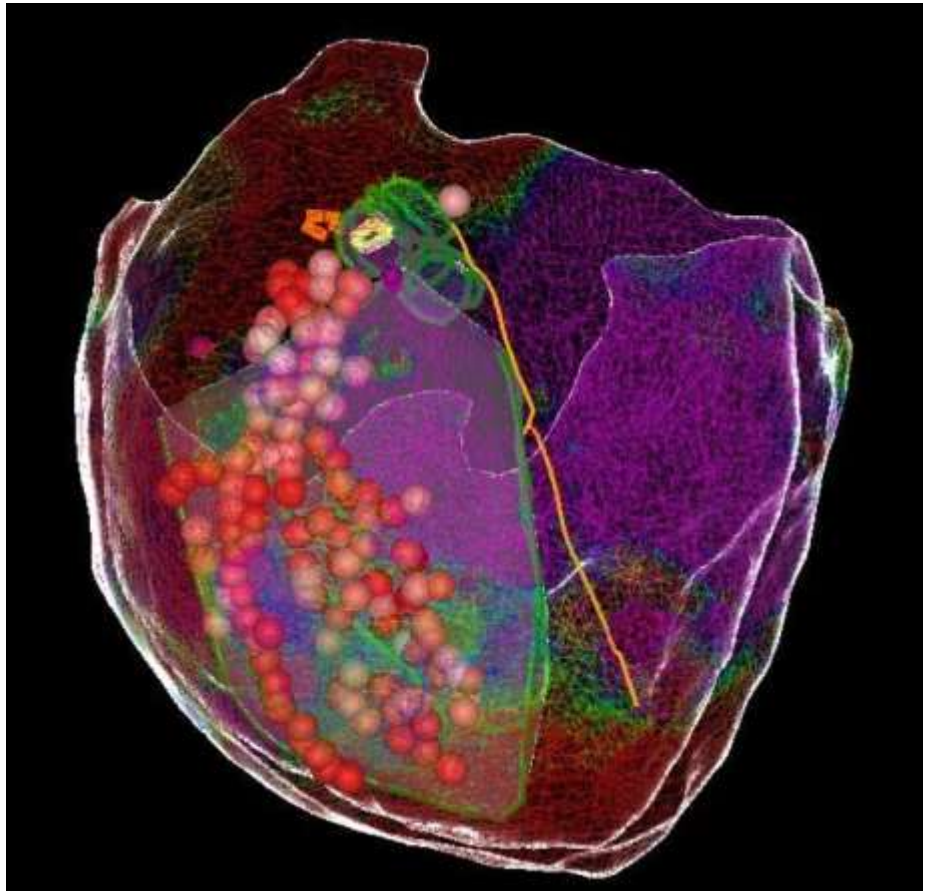
A second antiarrhythmic drug, mexiletine was added to Dofetilide.

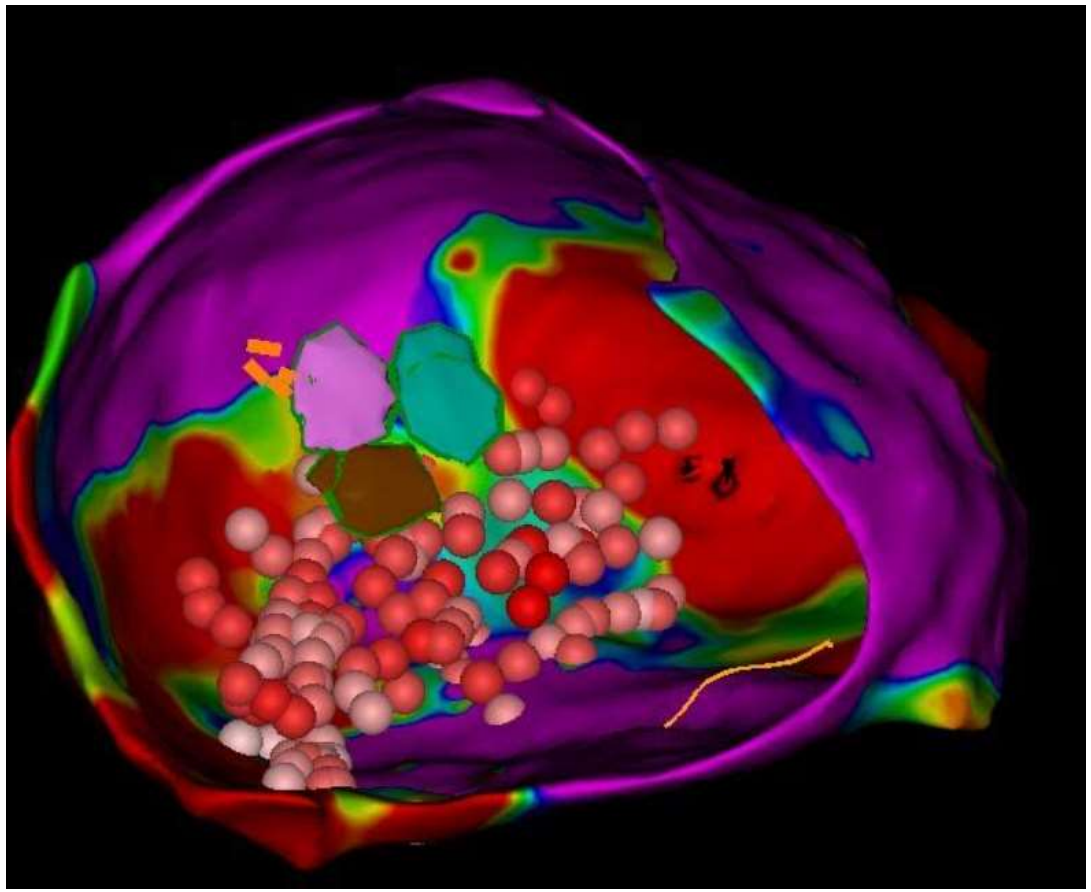
Both epi and endocardial ablation was performed


0.50 mV
Bi
1.50 mV


0.10 mV
Bi
0.50 mV
99
Tag.Idx
423


MAP
Imaging
3-EPI_ (7807, 0) Resp
Tag.Idx
427
482
30W
21.8°C
122Ω
22Sec
4-EPIC VT (90, 0) Resp
Corr
0.79
0.92
Tag.Idx
13
Force
13
f
429
Imp
120
Sec
022
Power
30
Temp
22
Stability
22
3.3mm
Pattern Matching
BS PTRN 7
4-EPIC VT
0.35
Close
AP PA LAO RAO LL RL INF SUP
None
0s
1s
2s
3s
4s





- After ablation, the patient did well and Mexillitine was discontinued.

# Conclusion:

## Ventricular tachycardia ablation:

- Successfully reduces the occurrences of ventricular arrhythmias.
- Successfully reduces the occurrences of appropriate ICD therapy
- Successfully reduces hospital admissions for cardiac reasons
- Improves quality of life

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# Thank you!