ՓՈՐՈՔԱՅԻՆ ՏԱԽԻԿԱՐԴԻԱՅԻ ՀՈՂՄԻ ԿԱԹԵՏԵՐԱՅԻՆ ԱԲԼԱՑԻԱ

Արմեն Խաչատրյան
Միջամտական Էլեկտրոֆիզիոլոգ
Նորք Մարաշ ԲԿ

Պատմությունը

1953
Correlation between cardiac aneurysm and VT (1953 Ann Intern Med)

1956
VT resolution after cardiac aneurysmectomy (1959 Circulation)

1973
Concomitant aneurysmectomy and coronary revascularization advocated for refractory VT (1973 Am J Cardiol)

1979
Endocardial excision introduced to treat ischemic VT (Circulation 1979)

1983
High-energy intracardiac catheter ablation employed to treat VT (1983 J Am Coll Cardiol)

1992
Radiofrequency ablation introduced for VT ablation (1992 Circulation, 1993 Circulation)

1993
Current model for critical circuit components with entrainment maneuvers (1993 Circulation)

1996
Epicardial access for mapping and ablation of non-ischemic VT (1996 J Cardiovasc Electrophysiol)

2000
Electroanatomic mapping employed for VT ablation (2000 Circulation)

Progress in Cardiovascular Diseases 66 (2021) 70–79

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journal homepage: www.onlinepcd.com

Electrical storm: Prognosis and management

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ՓՏ հողմի պրոգնոզը

Table 1
Definition and outcome of electrical storm.

Author, year	Electrical storm Definition	Total number of patients	Number of Patients with ES (%)	Outcome
Fries, 1997[21]	≥2 episodes separated by >1 h of sinus rhythm	57	34 (60%)	Mortality higher with ES (29% vs 4%, $P < 0.05$)
Credner, 1998[1]	VT or VF resulting in device intervention ≥3 times in 24 h	136	14 (10%)	No mortality difference
Bansch, 2000[6]	≥ 3 sustained VTs in 24 h	106	30 (28%)	Mortality higher with ES (54.2% vs 15.6%, $P < 0.004$)
Greene, 2000[8]	≥ 3 episodes of VT/VF requiring ICD therapy in 24 h	227	40 (18%)	No mortality difference
Exner, 2001[20]	≥ 3 separate VT/VF episodes in 24 h	457	90 (20%)	Mortality higher with ES (RR 2.4, 95% CI, 1.3–4.2; $P = 0.003$)
Verma, 2004[19]	≥2 separate episodes requiring shock within 24 h	2028	208 (10%)	Mortality higher with ES ($P = 0.001$)
Stuber, 2005[18]	≥ 3 episodes triggering appropriate ICD therapy in 2 weeks	214	51 (24%)	Mortality higher with ES (33% vs 13% $p = 0.003$)
Gatzoulis, 2005[17]	≥ 3 episodes terminated by the device or external defibrillation in 24 h	169	32 (19%)	Mortality higher with ES (53 vs 14% $p \leq 0.001$)
Hohnloser, 2006[16]	≥ 3 separate episodes leading to ICD therapies in 24 h	633	148 (23%)	Hospitalization increased 10.2 folds with ES
Brigadeau, 2006[9]	≥ 2 separate episodes leading to ICD therapy in 24 h	307	123 (40%)	No mortality difference
Sesselberg, 2007[15]	≥ 3 episodes in 24 h	719	27 (4%)	Mortality higher with ES (HR 17.8, $P < 0.01$)
Nordbeck, 2010[14]	≥ 3 episodes in 24 h	729	40 (5%)	Mortality higher with ES (33% vs 2%, $P < 0.05$)
Nedios, 2015[12]	≥ 3 separate episodes in 24 h	330	23 (7%)	Mortality higher with ES (22% vs 2%, $P < 0.001$)
Guerra, 2016[11]	≥ 3 episodes in 24 h	1319	62 (5%)	Mortality Higher with ES ($p = 0.025$)
Kwasniewski, 2016[13]	≥ 3 episodes in 24 h	416	50 (12%)	Mortality higher with ES (50% vs 30%, $P = 0.036$)
Elsokkari, 2020[2]	Variable	1764	465 (26%)	Mortality higher with ES, HR variable according to cluster definition

ՓՏ հողմի

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Definition and outcome of electrical storm.

Author, year	Electrical storm Defi	Outcome
Fries, 1997[21]	≥2 episodes separate	Mortality higher with ES (29% vs 4%, $P < 0.05$)
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Elsokkari, 2020[2]	Variable	Mortality higher with ES, HR variable according to cluster definition

ՓՏ հողմի վարումը

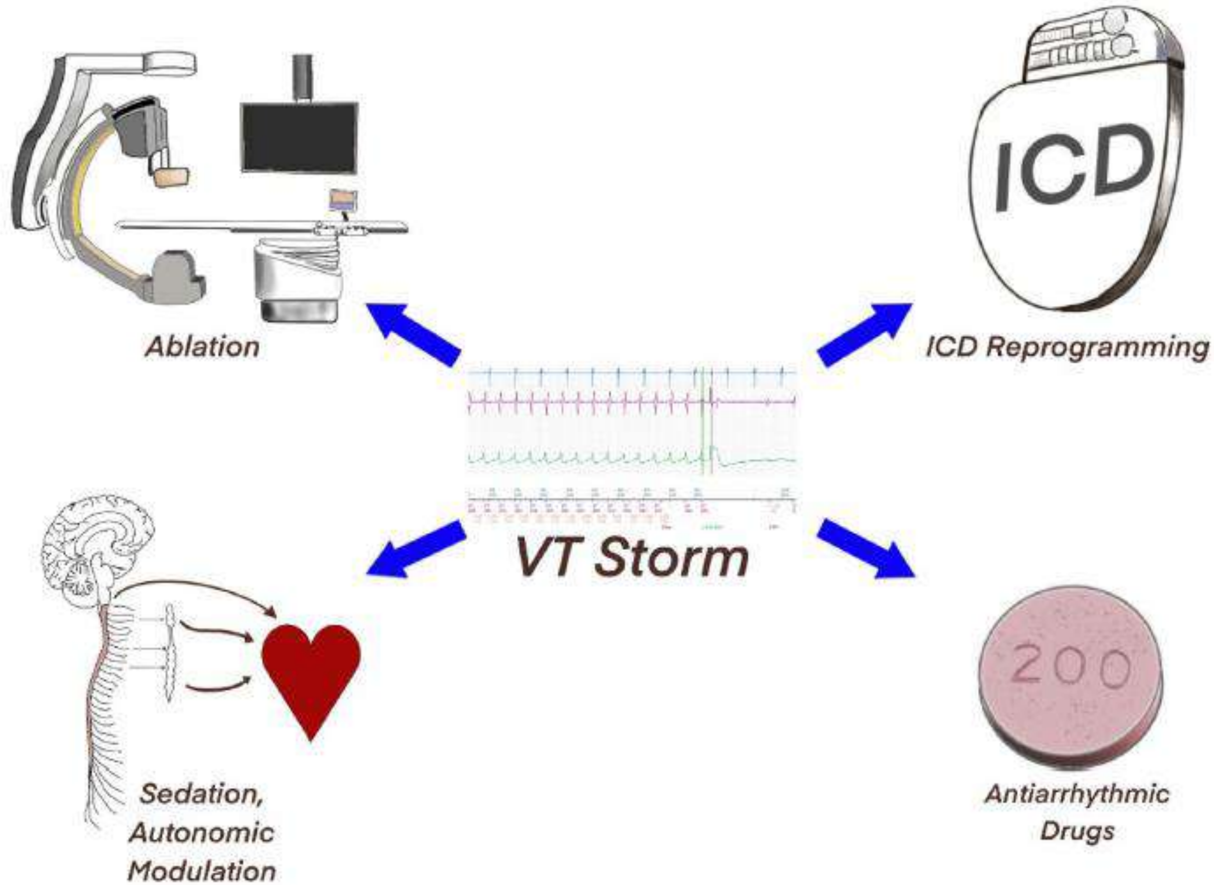

Fig. 2. VT storm may require a multimodal approach, including appropriate programming of a patient's implantable defibrillator if present, use of beta-blockade and other neuromodulation/sedation, antiarrhythmic drugs and/or catheter ablation procedures.

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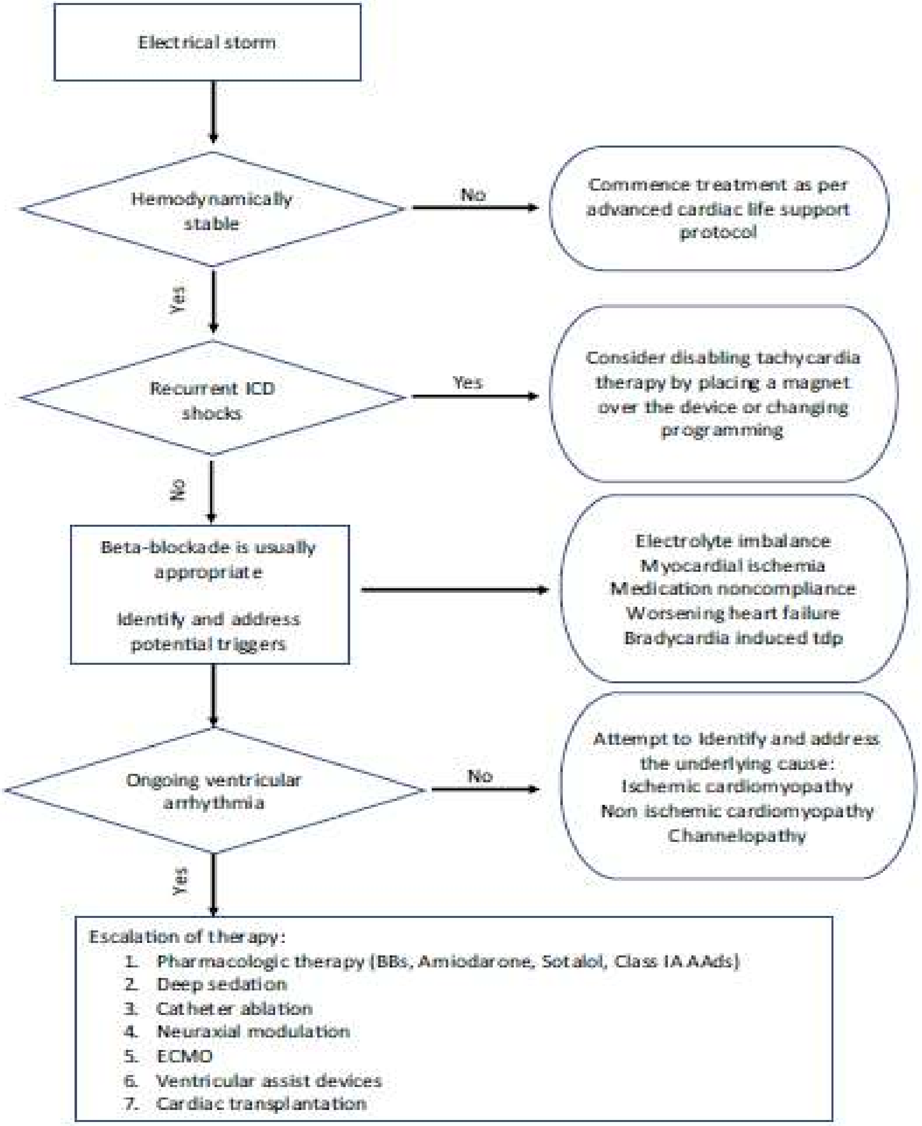
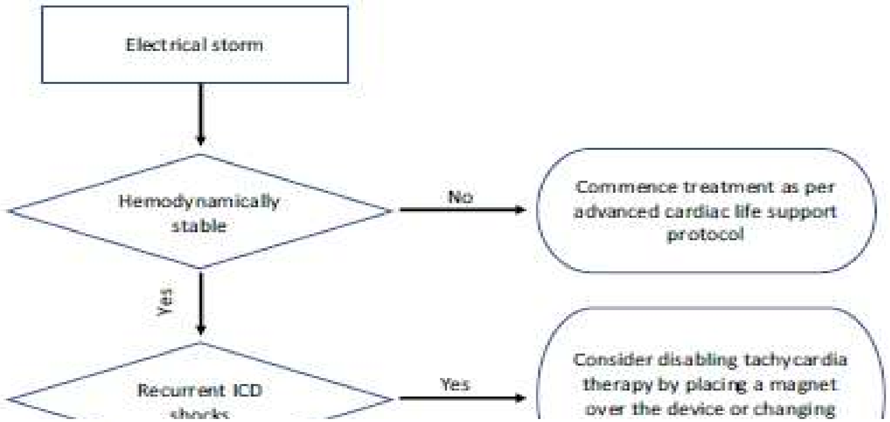


ՓՏ հողմի վարումը



Escalation of therapy:

1. Pharmacologic therapy (BBs, Amiodarone, Sotalol, Class IA AAds)
2. Deep sedation
3. Catheter ablation
4. Neuraxial modulation
5. ECMO
6. Ventricular assist devices
7. Cardiac transplantation

Կաթետերային աբլացիայի արդյունավետությունը

Table 2
catheter ablation outcomes in electrical storm.

Author/Year	# Pts ICM	# Pts NICM and other	Mortality ICM	Mortality NICM and other	VT Recurrence ICM	VT Recurrence NICM and other	Storm Recurrence ICM	Storm Recurrence NICM and other	Follow-up Duratoin (months)
Sra 2001[106]	19				37%				7 ± 2
Silva 2004[63]	9	6			13%				12 ± 17
Carbucicchio 2008[107]	72	23			34%		8%		Median 22
Arya 2010[83]		13				38%			Med 23
Pluta 2010[108]	21				19%		0	0	3
Deneke 2011[66]	17	14			29%	35%	0	14%	Med 15
Kozeluhova 2011[82]	38	12			52%		26%		18 ± 16
Kozluk 2011[109]	18	6			34%		12%		28 ± 16
DiBiase 2012[110]	92				34%				25 ± 10
Izquierdo 2012[67]	19	4					35%		Med 18
Jin 2015[111]	40				53%				17 ± 17
Muser 2017[84]	196	71	29%	27%	46%	52%	5% 7% at 60 mo	6% 9% at 60 mo	Median 45
Kumar 2017[29]	186	101	25% at 12 months	28% at 12 months	49% at 12 months	64% at 12 months	32/186	27/101	51 ± 46, median 42

Adapted from Muser[84] and updated with Kumar results.[29]

Կաթետերային աբլացիայի արդյունավետությունը

Mortality NICM and other	VT Recurrence ICM	VT Recurrence NICM and other
	37%	
	13%	
	34%	
		38%
	19%	
	29%	35%
	52%	
	34%	
	34%	
	53%	
27%	46%	52%
28% at 12 months	49% at 12 months	64% at 12 months

Table 2
catheter ablation outcomes in

Author/Year	# Pts ICM	...rm ...currence ...CM and other	Follow-up Duratoin (months)
Sra 2001[106]	19		7 ± 2
Silva 2004[63]	9		12 ± 17
Carbucicchio 2008[107]	72		Median 22
Arya 2010[83]			Med 23
Pluta 2010[108]	21		3
Deneke 2011[66]	17	%	Med 15
Kozeluhova 2011[82]	38		18 ± 16
Kozluk 2011[109]	18		28 ± 16
DiBiase 2012[110]	92		25 ± 10
Izquierdo 2012[67]	19		Med 18
Jin 2015[111]	40		17 ± 17
Muser 2017[84]	196	at 60 mo	Median 45
Kumar 2017[29]	186	/101	51 ± 46, median 42

Adapted from Muser[84] and up

European Heart Journal (2015) **36**, 2793–2867
doi:10.1093/eurheartj/ehv316

ESC GUIDELINES

2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death

The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC)

Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC)

Catheter ablation for the treatment of sustained monomorphic ventricular tachycardia

Recommendations	Class[a]	Level[b]	Ref.[c]
Urgent catheter ablation is recommended in patients with scar-related heart disease presenting with incessant VT or electrical storm.	I	B	183
Catheter ablation is recommended in patients with ischaemic heart disease and recurrent ICD shocks due to sustained VT.	I	B	184–186
Catheter ablation should be considered after a first episode of sustained VT in patients with ischaemic heart disease and an ICD.	IIa	B	184–186

ICD = implantable cardioverter defibrillator; VT = ventricular tachycardia.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

Catheter ablation for long-term suppression/prevention of an electrical storm or recurrent ICD discharges should be considered.	**IIa**	**B**

Radiofrequency catheter ablation at a specialized ablation centre followed by the implantation of an ICD should be considered in patients with recurrent VT, VF or electrical storms despite complete revascularization and optimal medical treatment.	**IIa**	**C**

Catheter ablation of PVCs leading to electrical storm is recommended when performed by experienced operators.	I	B

Catheter ablation may be considered in patients with a history of electrical storms or repeated appropriate ICD shocks.	IIb	C

Substrate Mapping and Ablation in Sinus Rhythm to Halt Ventricular Tachycardia (SMASH-VT) study

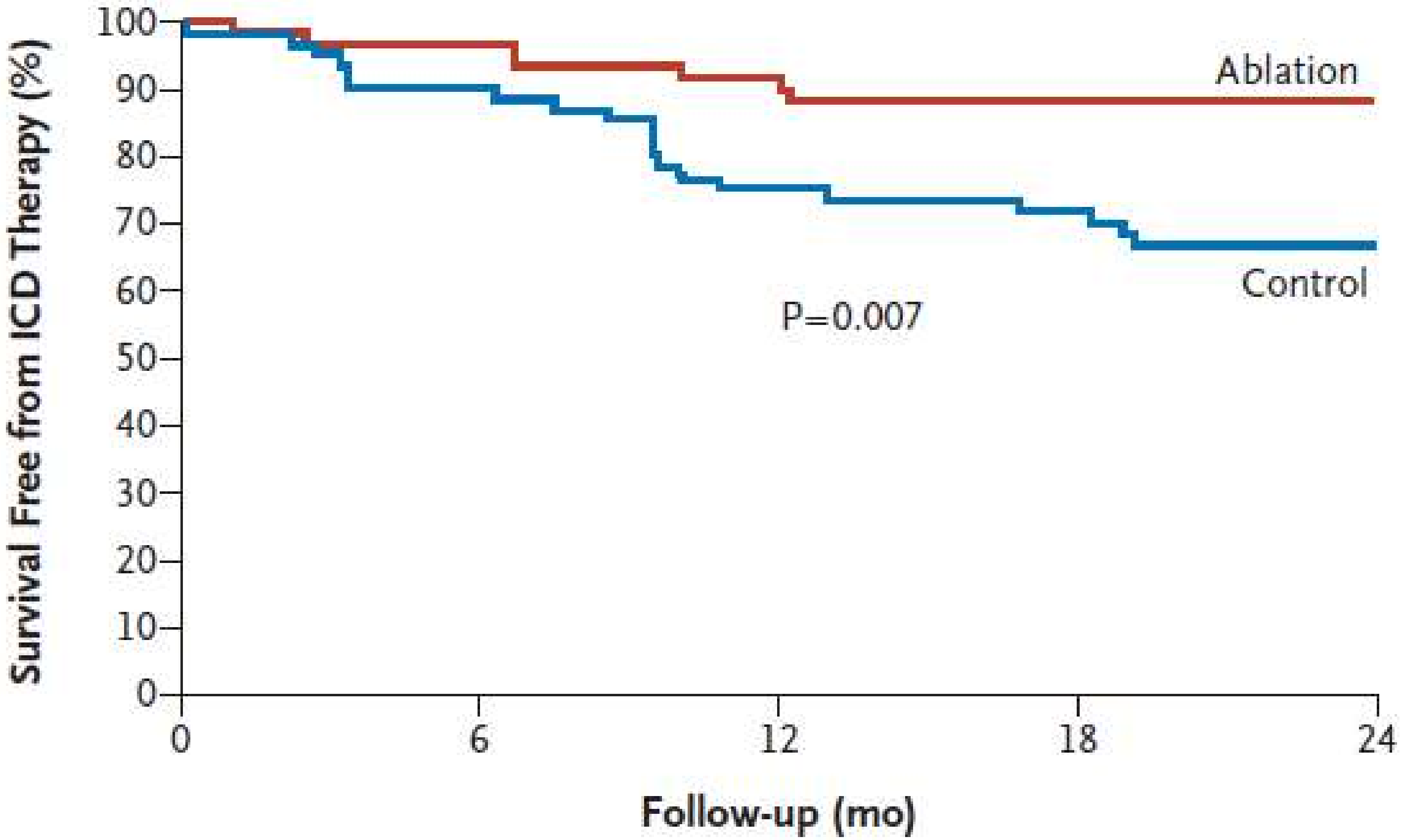
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 27, 2007 VOL. 357 NO. 26

Prophylactic Catheter Ablation for the Prevention of Defibrillator Therapy

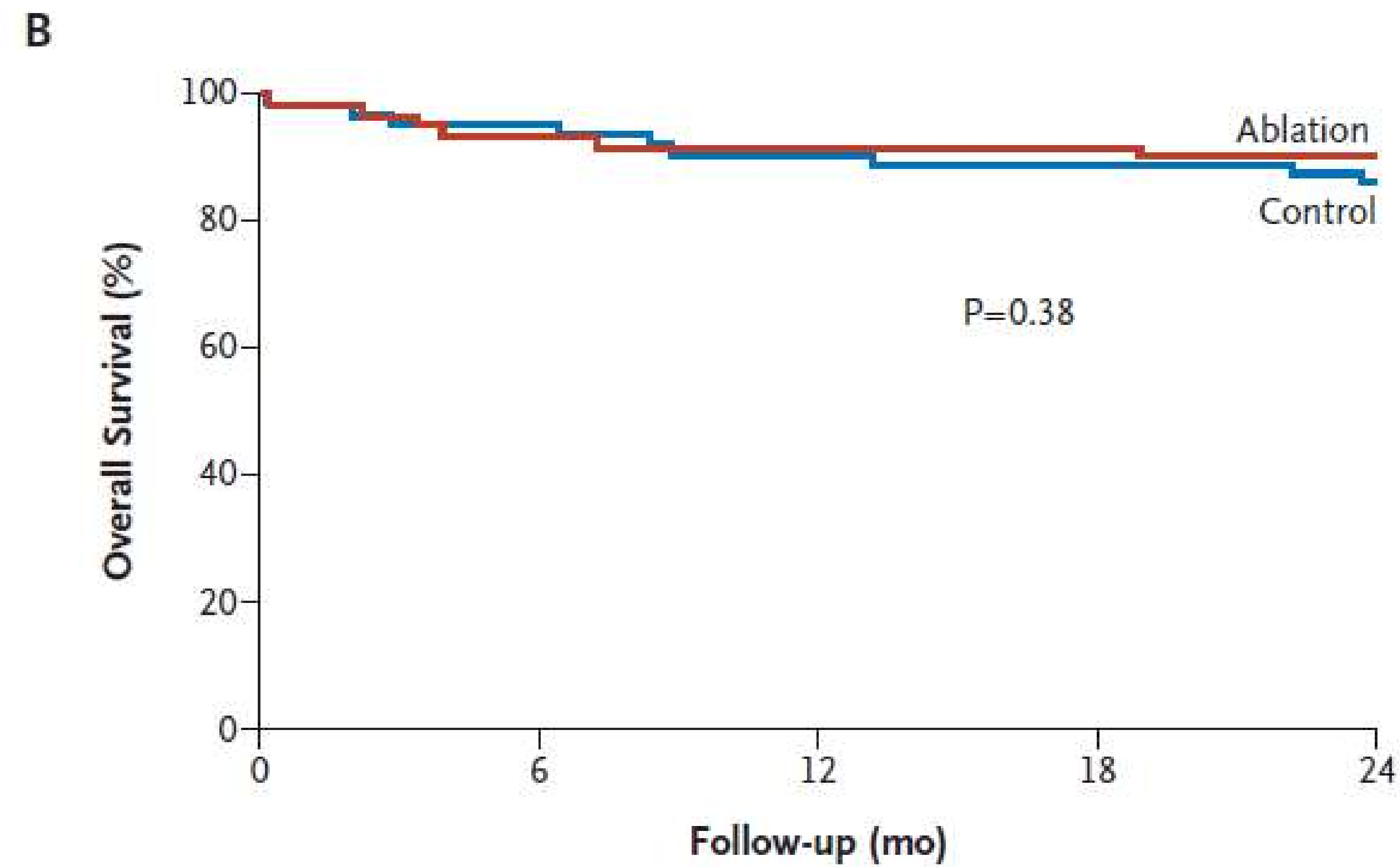
Vivek Y. Reddy, M.D., Matthew R. Reynolds, M.D., Petr Neuzil, M.D., Ph.D., Allison W. Richardson, M.D., Milos Taborsky, M.D., Ph.D., Krit Jongnarangsin, M.D., Stepan Kralovec, Lucie Sediva, M.D., Jeremy N. Ruskin, M.D., and Mark E. Josephson, M.D.

SMASH-VT



Survival Free from ICD Therapy (%)
100
90
80
70
60
50
40
30
20
10
0
Ablation
Control
P=0.007
0
6
12
18
24
Follow-up (mo)

SMASH-VT



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

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

*Karl-Heinz Kuck, Anselm Schaumann, Lars Eckardt, Stephan Willems, Rodolfo Ventura, Etienne Delacrétaz, Heinz-Friedrich Pitschner, Josef Kautzner, Burghard Schumacher, Peter S Hansen, for the VTACH study group**

Summary

Background In patients with ventricular tachycardia (VT) and a history of myocardial infarction, intervention with an implantable cardioverter defibrillator (ICD) can prevent sudden cardiac death and thereby reduce total mortality. However, ICD shocks are painful and do not provide complete protection against sudden cardiac death. We assessed the potential benefit of catheter ablation before implantation of a cardioverter defibrillator.

Lancet 2010; 375: 31–40

See Comment page 4

*Members listed at end of paper

Hanseatisches Herzzentrum, Asklepios Klinik St Georg,

VTACH

Methods The Ventricular Tachycardia Ablation in Coronary Heart Disease (VTACH) study was a prospective, open,
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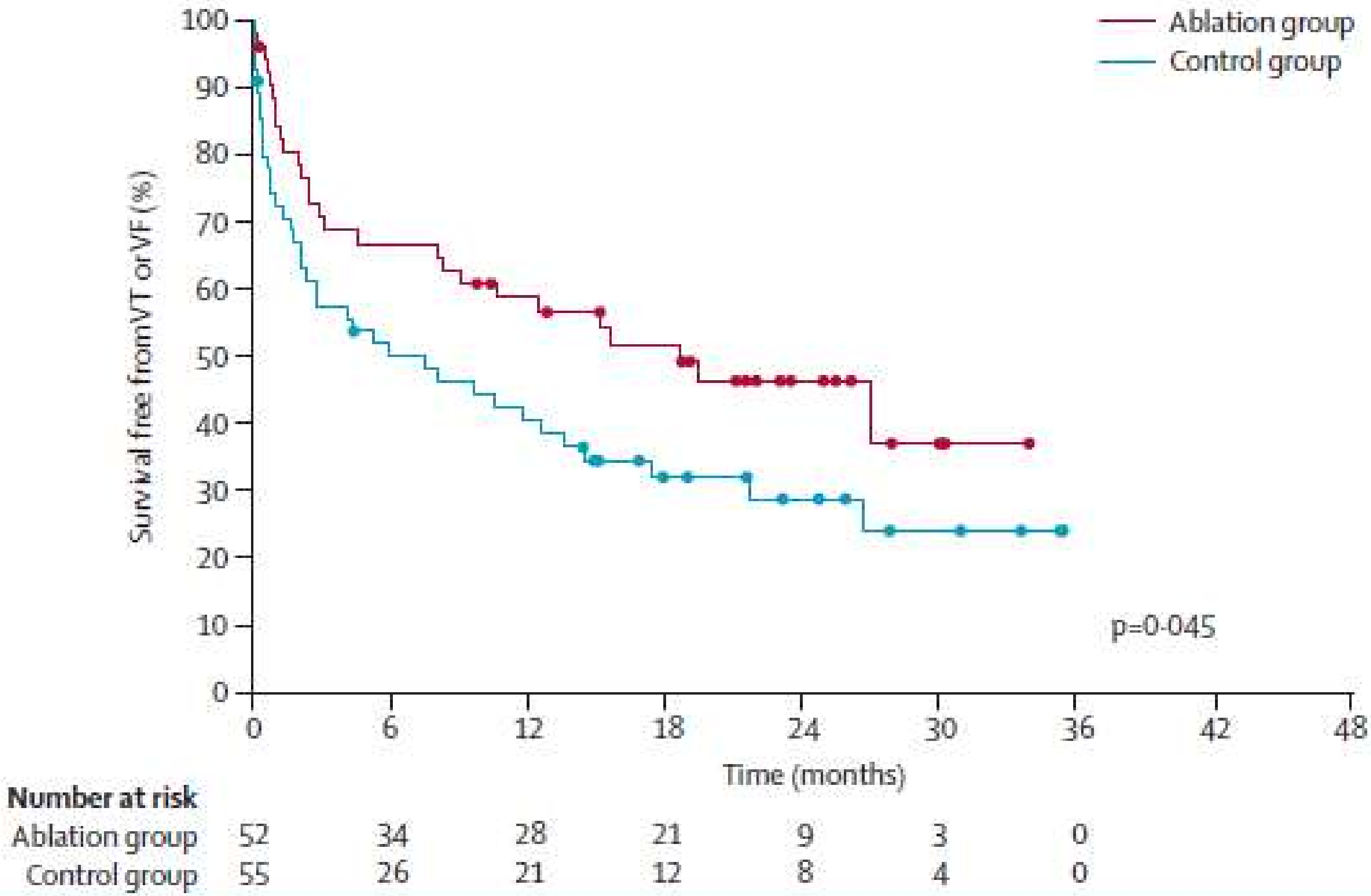

VANISH

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

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., Stanley K. Tung, M.D., Jean-Marc Raymond, M.D., Laurence D. Sterns, M.D., George D. Veenhuyzen, M.D., Jeff S. Healey, M.D., Damian Redfearn, M.D., Jean-Francois Roux, M.D., and Anthony S.L. Tang, M.D.

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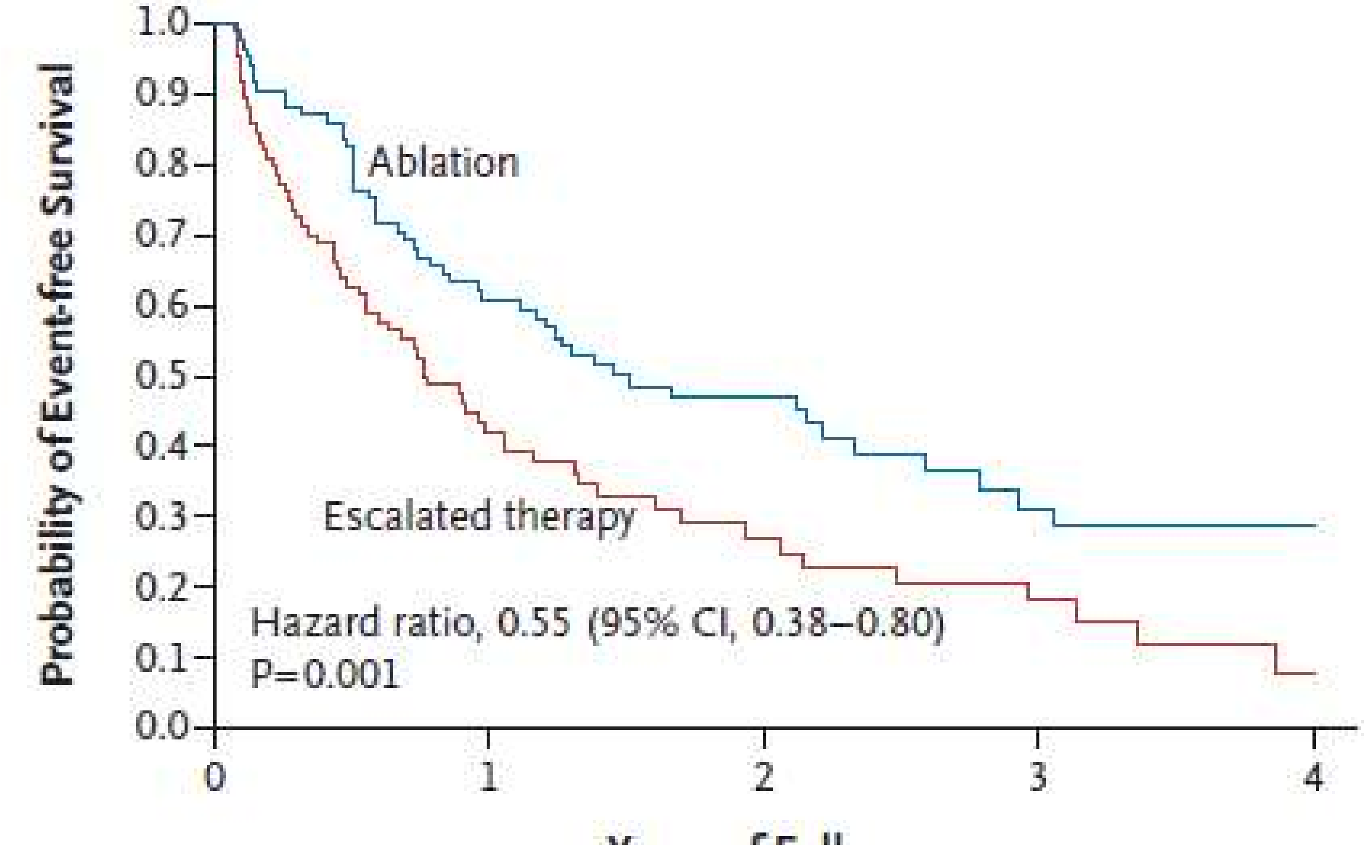
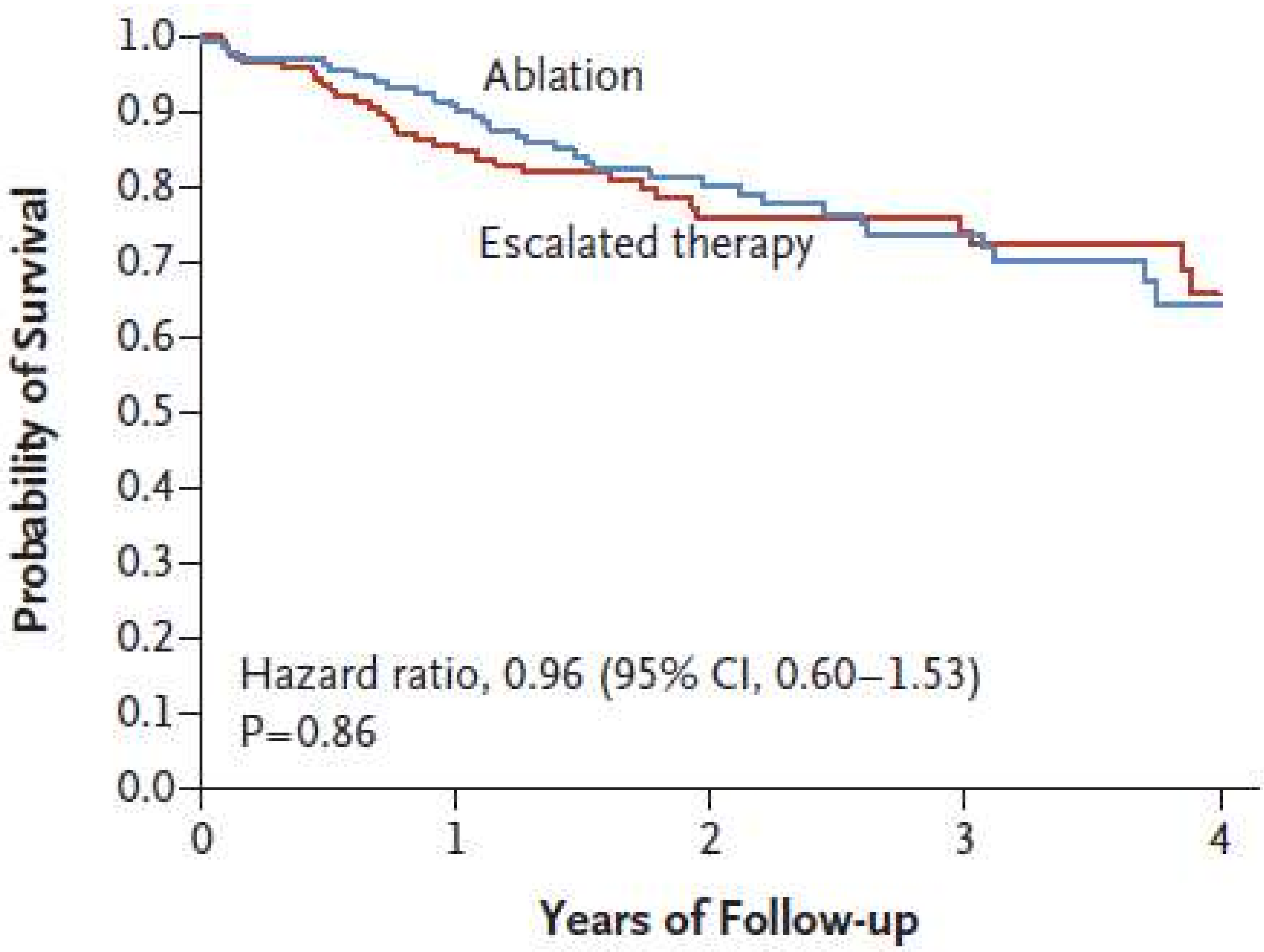


Probability of Event-free Survival
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
1
2
3
4
Ablation
Escalated therapy
Hazard ratio, 0.55 (95% CI, 0.38–0.80)
P=0.001

VANISH

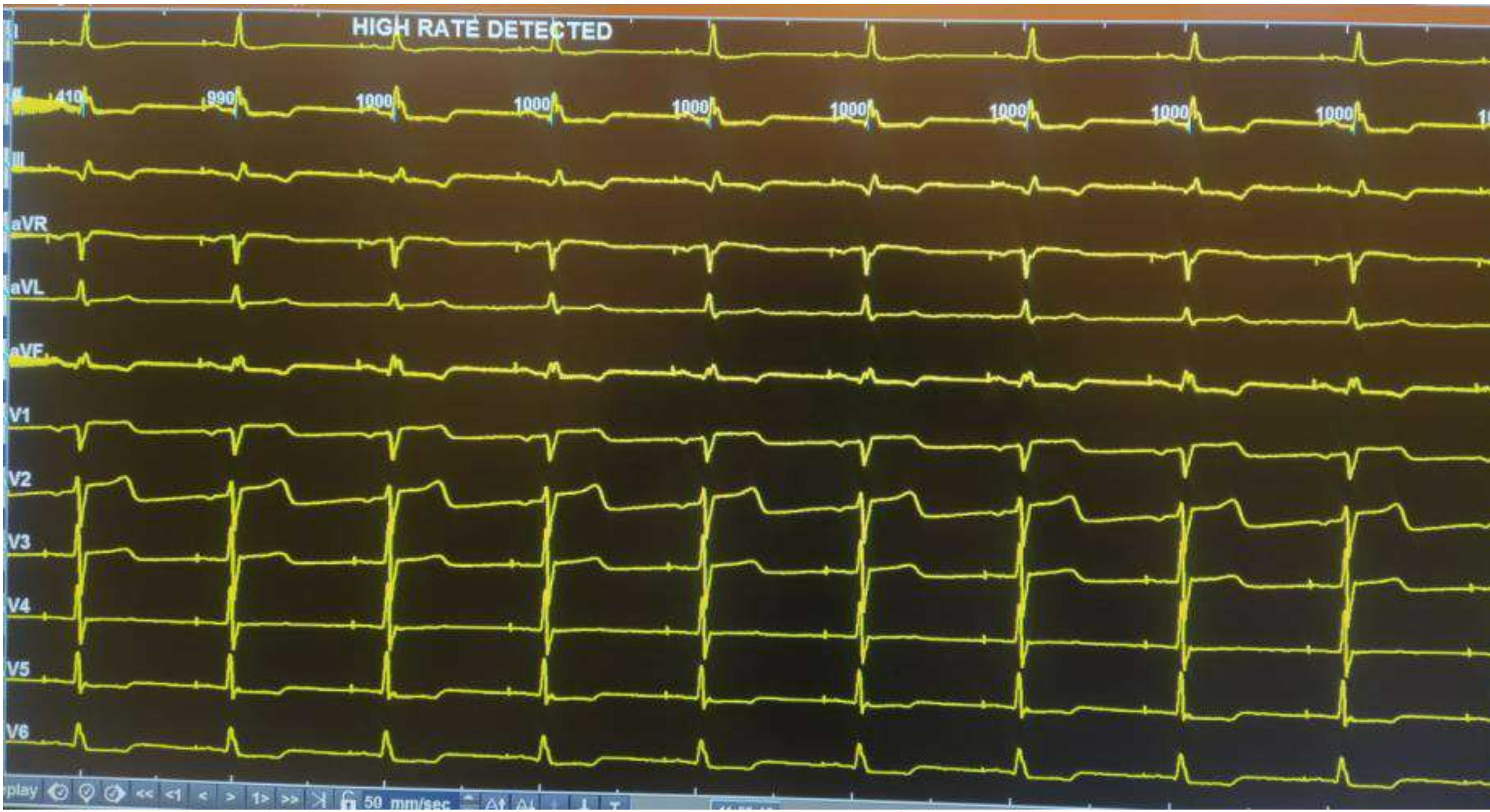


Ablation
Escalated therapy
Hazard ratio, 0.96 (95% CI, 0.60–1.53)
P=0.86
Probability of Survival
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
1
2
3
4
Years of Follow-up

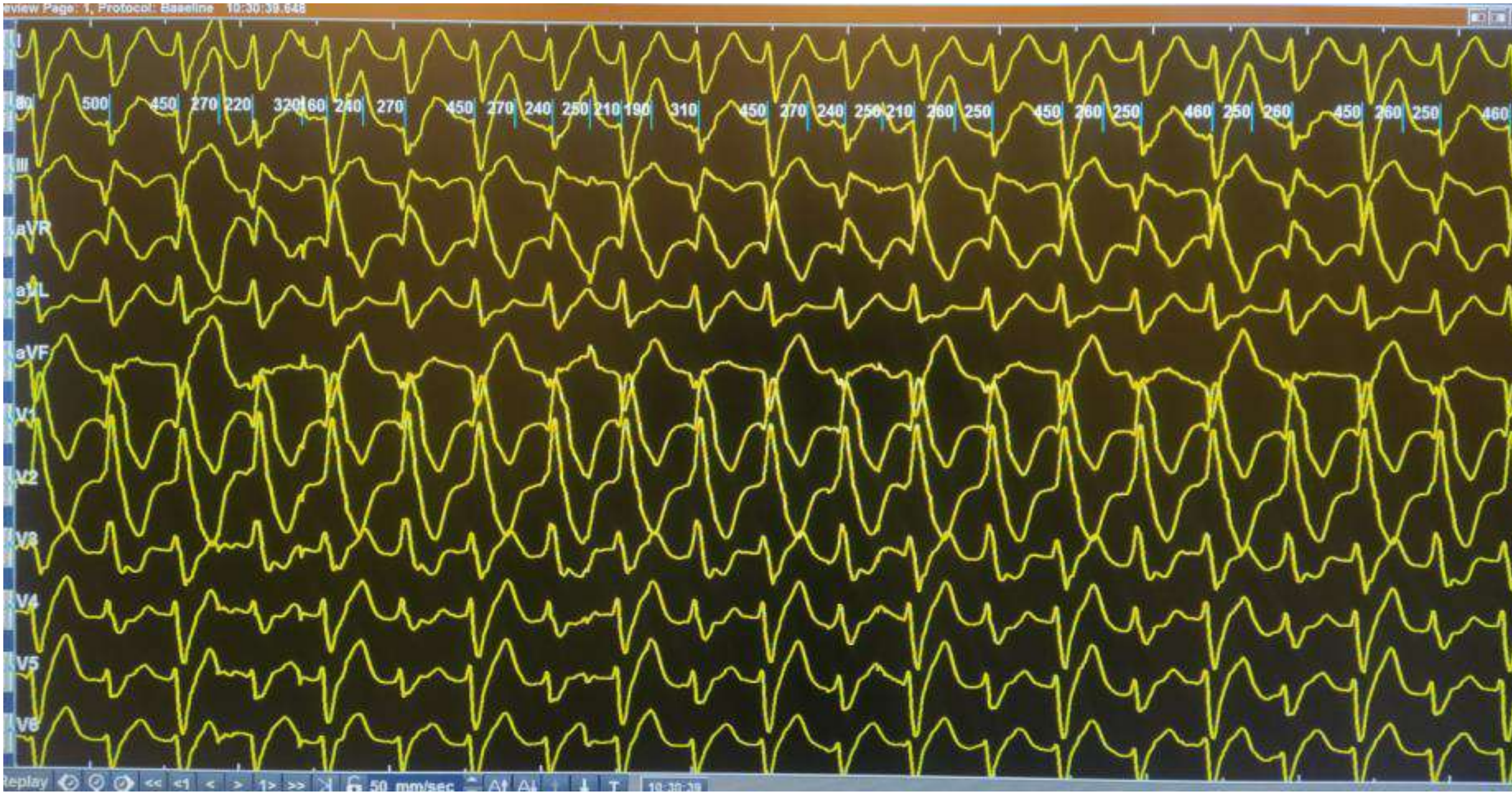
Կլինիկական դեպք

- 62 տ. տղամարդ
- ԻԿՄՊ, ՁՓԱՖ=25%, NYHA II+
- ԱԿՇ 2015թ
- ԿՎԴ 2019թ
- Բազմաթիվ ՓՏ էպիզոդներ վերջին 6 ամսում 130-170bpm
- 6 ԿՎԴ շոկ 1 շաբաթվա ընթացքում, որից 3-ը՝ մեկ օրում
- ԷՍԳ և հոլտեր – Մոնոմորֆ ՓՏ, ՅԽԱՌՊ
- Օպտիմալ դեղորայքային բուժում
- Լաբորատոր քննության շեղումներ չեն դիտվել

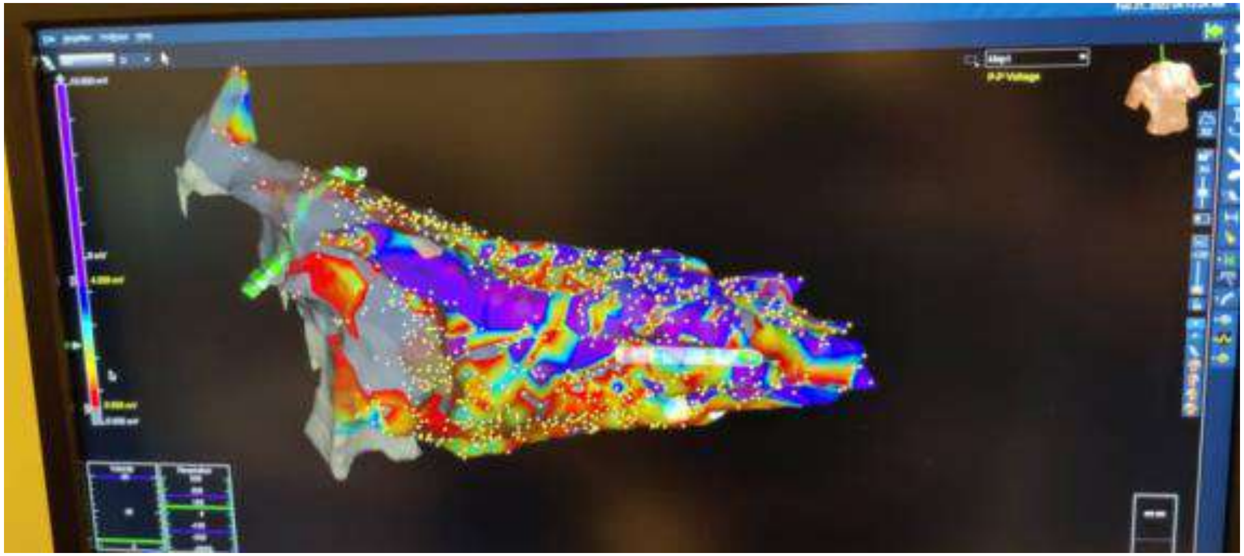
Հանգստի ԷՍԳ

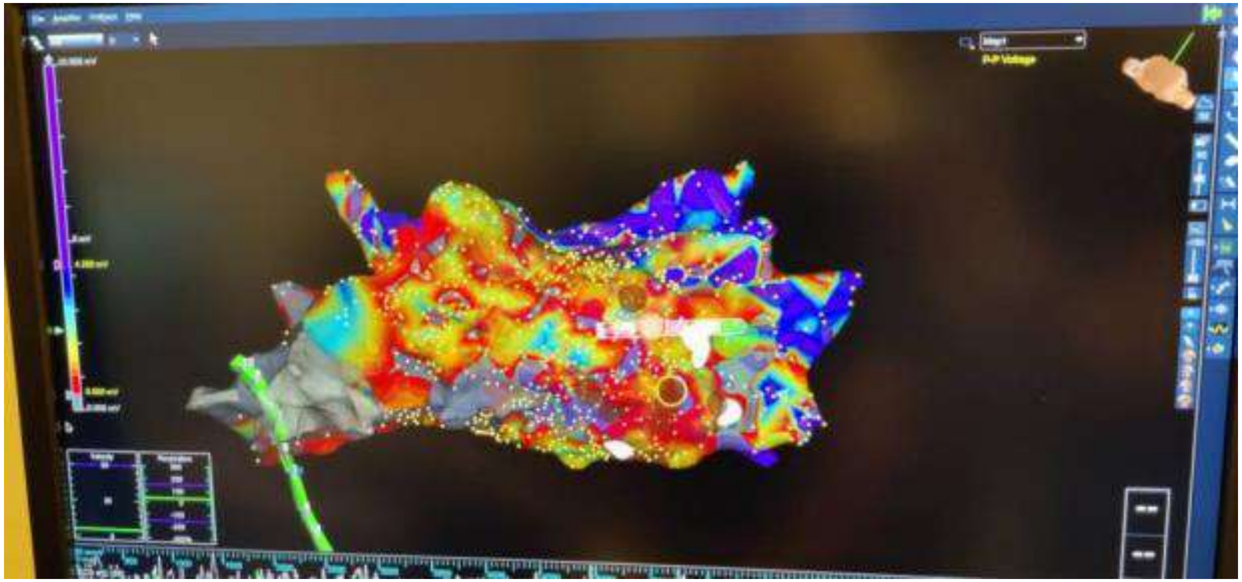

HIGH RATE DETECTED
410
990
1000
1000
1000
1000
1000
1000
1000
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
50 mm/sec

Փորոքային տախիկարդիա



Էլեկտրոանատոմիական 3D քարտեզագրում





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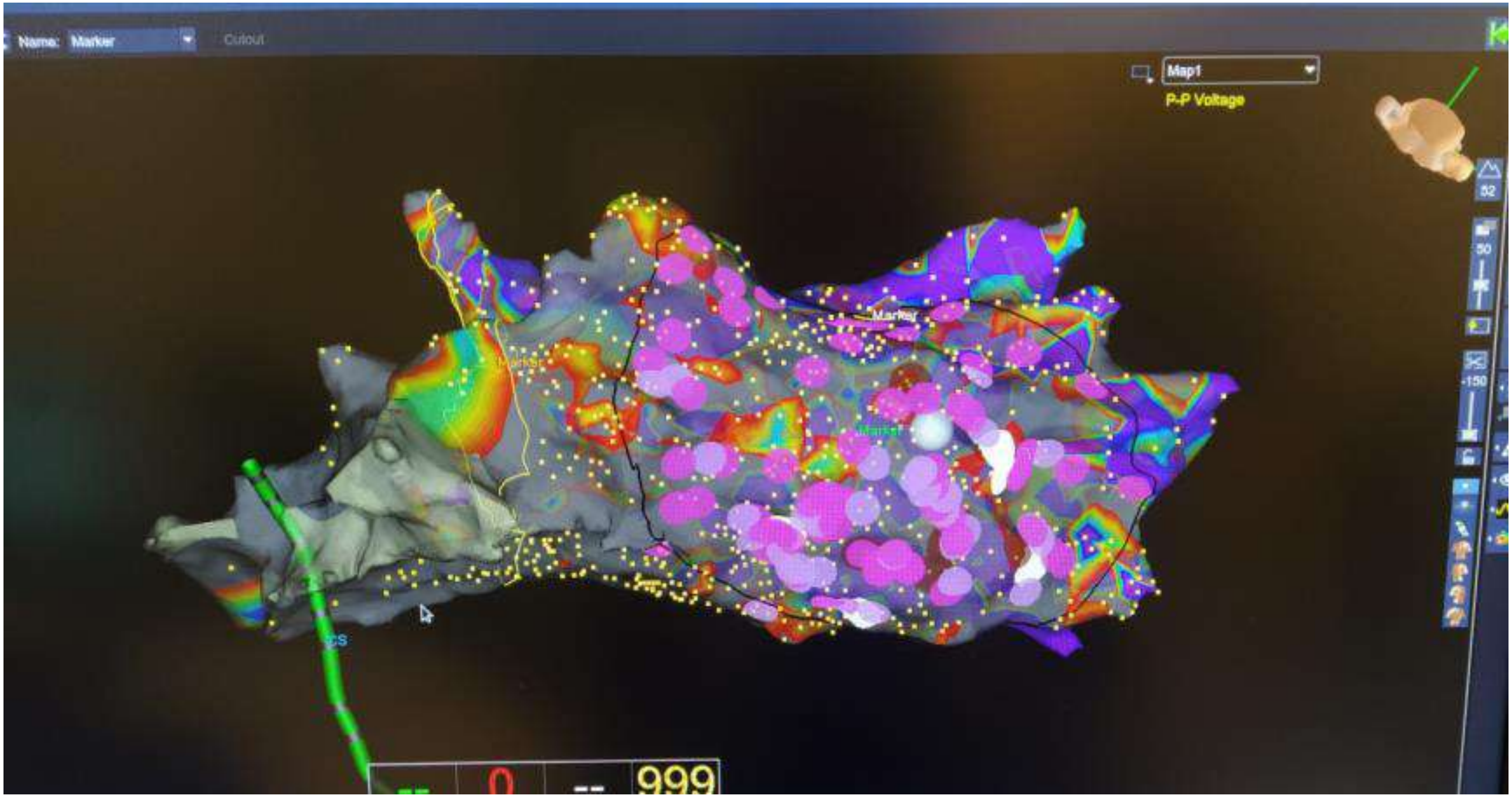

Follow up

- Հետաբլացիոն 3 ամիսների ընթացքում ԿՎԴ սարքով գրանցված փորոքային տախիկարդիայի 0 էպիզոդ:

Շնորհակալություն ուշադրության համար