

# 4<sup>ο</sup> Συνέδριο Επεμβατικής Καρδιολογίας και Ηλεκτροφυσιολογίας

Εκφορτίσεις εμφυτευμένου απινιδωτή: επίδραση  
στη νοσηρότητα και στη θνητότητα

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# ΗΘ

- 10-20% ασθενείς με ΕΑΒΑ
- $\geq 3$  VT/VF επεισόδια/24 hr
- Συνηθέστερα σε ασθενείς για δευτερογενή πρόληψη ΑΚΘ
- Μακροχρόνια πρόγνωση αμφιλεγόμενη



**Table 1** Comparison of patients with and without ES

	Patients with ES (n=32)	Patients without ES (n=137)	P value
Age (years)	64±9	59±13	0.013
Sex (M)	28 (88%)	114 (83%)	0.551
History of			
CAD (%)	21 (66%)	81 (59%)	0.498
DCMP (%)	5 (16%)	22 (16%)	0.952
ARVD (%)	3 (9%)	8 (6%)	0.465
HCM (%)	0 (0%)	14 (10%)	0.059
Other (%)	3 (9%)	12 (9%)	0.951
LVEF (%)	31±14	35±14	0.179
NYHA class	2.4±0.7	2.1±0.7	0.036
Follow up (months)	38±2	32±3	0.137

ES = Electrical storm, CAD = Coronary artery disease, DCMP = Dilated cardiomyopathy, ARVD = Arrhythmogenic right ventricular dysplasia, HCM = Hypertrophic cardiomyopathy, LVEF = Left ventricular ejection fraction, NYHA = New York Heart Association.

*Gatzoulis KA, Andrikopoulos GK, Apostolopoulos T, Sotiropoulos E, Zervopoulos G, et al, Europace 7:184-192, 2005*



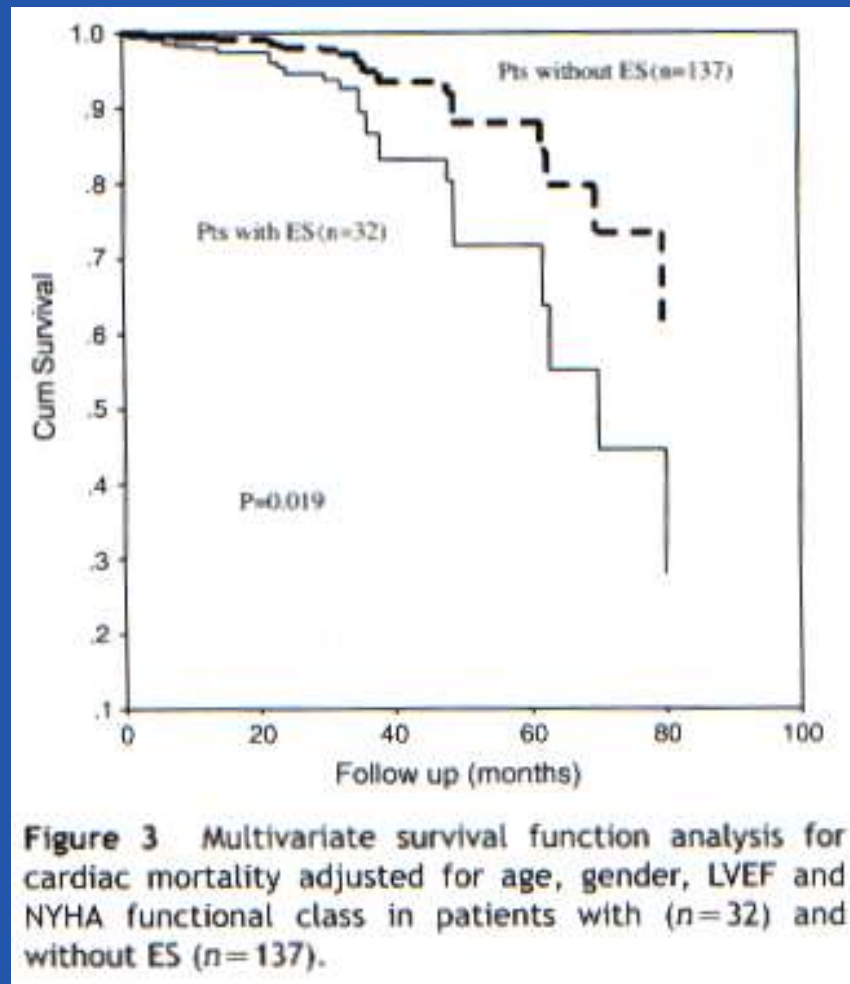
**Table 2** Comparison of patients undergoing ICD implantation for primary and secondary prevention

	ICD patients primary prevention (n=18)	ICD patients secondary prevention (n=151)	P value
Age (years)	57 ± 18	61 ± 12	0.266
Sex (Female/Male)	0/18	27/124	0.050
History of			
CAD (%)	14 (78%)	88 (58%)	0.110
DCMP (%)	2 (11%)	25 (17%)	0.692
ARVD (%)	0 (0%)	11 (7.3%)	0.236
HCM (%)	2 (11%)	12 (7.9%)	0.645
LVEF (%)	28 ± 10	35 ± 14	0.058
NYHA class	2.28 ± 0.7	2.19 ± 0.7	0.611
ES (%)	0 (0%)	32 (21%)	0.030
Follow up (months)	25 ± 13	34 ± 27	0.164

ES = Electrical storm, CAD = Coronary artery disease, DCMP = Dilated cardiomyopathy, ARVD = Arrhythmogenic right ventricular dysplasia, HCM = Hypertrophic cardiomyopathy, LVEF = Left ventricular ejection fraction, NYHA = New York Heart Association.

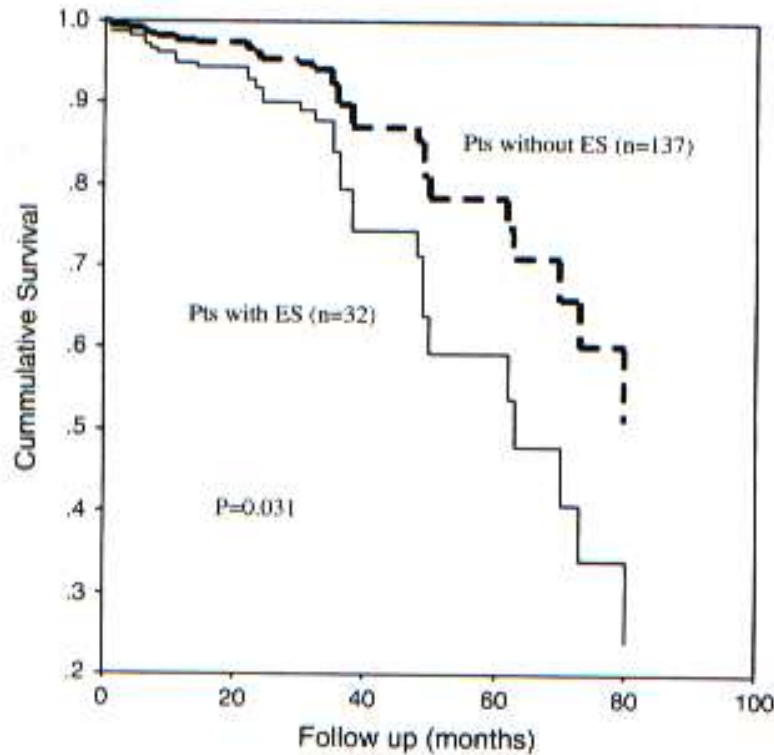
*Gatzoulis KA, Andrikopoulos GK, Apostolopoulos T, Sotiropoulos E, Zervopoulos G, et al, Europace 7:184-192, 2005*





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**Figure 2** Multivariate survival function analysis for total mortality adjusted for age, gender, LVEF and NYHA functional class in patients with ( $n=32$ ) and without ES ( $n=137$ ).

*Gatzoulis KA, Andrikopoulos GK, Apostolopoulos T, Sotiropoulos E, Zervopoulos G, et al, Europace 7:184-192, 2005*



# ΠΡΟΓΝΩΣΤΙΚΗ ΣΗΜΑΣΙΑ ΗΘ ΣΕ ΑΣΘΕΝΕΙΣ ΜΕ ΕΜΦΥΤΕΥΣΙΜΟ ΑΠΙΝΙΔΩΤΗ

<i>Συγγραφέας</i>	<i>Αρ. ασθ</i>	<i>ΗΘ(%)</i>	<i>Ορισμός</i>	<i>Διάρκεια παρακολούθησης</i>	<i>Μακροχρόνια έκβαση</i>
Villacastin Circ 1996	80	16 (20%)	3/24 hr	21±19	ΠΙΘΑΝΟΝ ΑΡΝΗΤΙΚΗ
Credner Jacc 1998	136	14 (10%)	3/24 hr	13±7	ΟΥΔΕΤΕΡΗ
Exner (AVID) Circ 2001	457	90 (19%)	3/24 hr	31±13	ΑΡΝΗΤΙΚΗ
Verma JCE 2004	2028	208 (10%)	2/24 hr	22±5	ΑΡΝΗΤΙΚΗ
Gatzoulis EUROPACE	169	32 (19%)	3/24 hr	33±26	ΑΡΝΗΤΙΚΗ
Brigadeaou EHJ 2006	307	123 (40%)	2/24 hr	28±10	ΟΥΔΕΤΕΡΗ

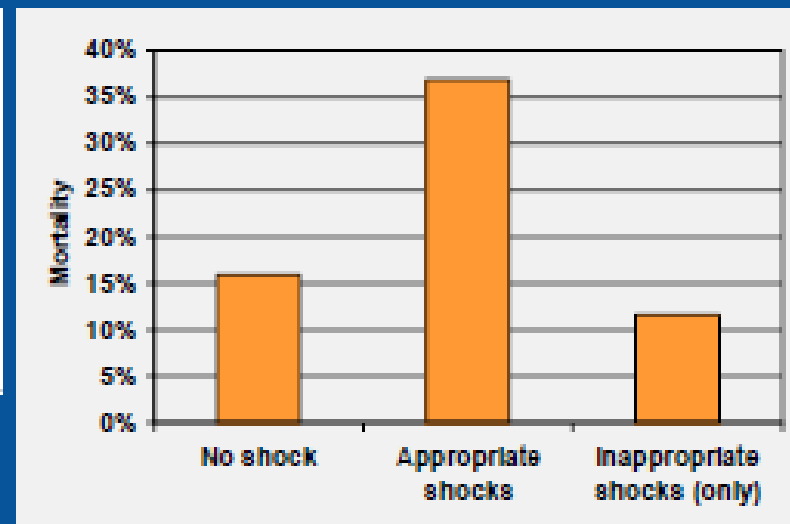
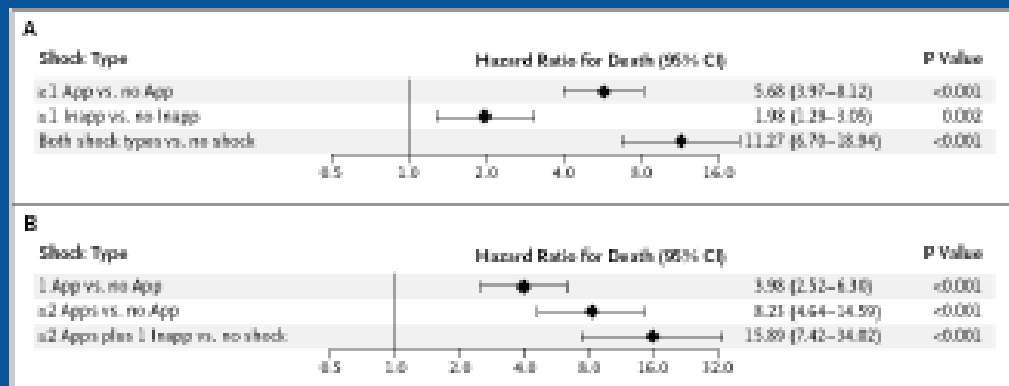
ΗΘ: ηλεκτρική θύελλα, Αρ. Ασθ: αριθμός ασθενών, Ασθ: ασθενείς ΚΤ: εμμένουσα κοιλιακή ταχυκαρδία, ΚΜ: κοιλιακή μαρμαρυγή

# ICD Shocks

- **Appropriate shocks:** Shocks triggered by potentially life-threatening arrhythmias
  - **Unnecessary shocks:** Other painless therapy can be used to terminate arrhythmia
  - **Necessary shocks :** Shock for arrhythmias not terminated by other means
- **Inappropriate Shocks:** Shocks triggered by an inappropriate detection

# Prognostic Importance of ICD Shocks

- SCD-HeFT patients who received and ICD (n=811)
- 33.2% received shocks: 15.8% only appropriate, 10.7% only inappropriate and 6.7% both
- Patients who receive shocks for any arrhythmia have a higher risk of death than those who do not receive such shocks



# Inappropriate Shocks in Clinical Practice



# Inappropriate Shocks in Clinical Practice

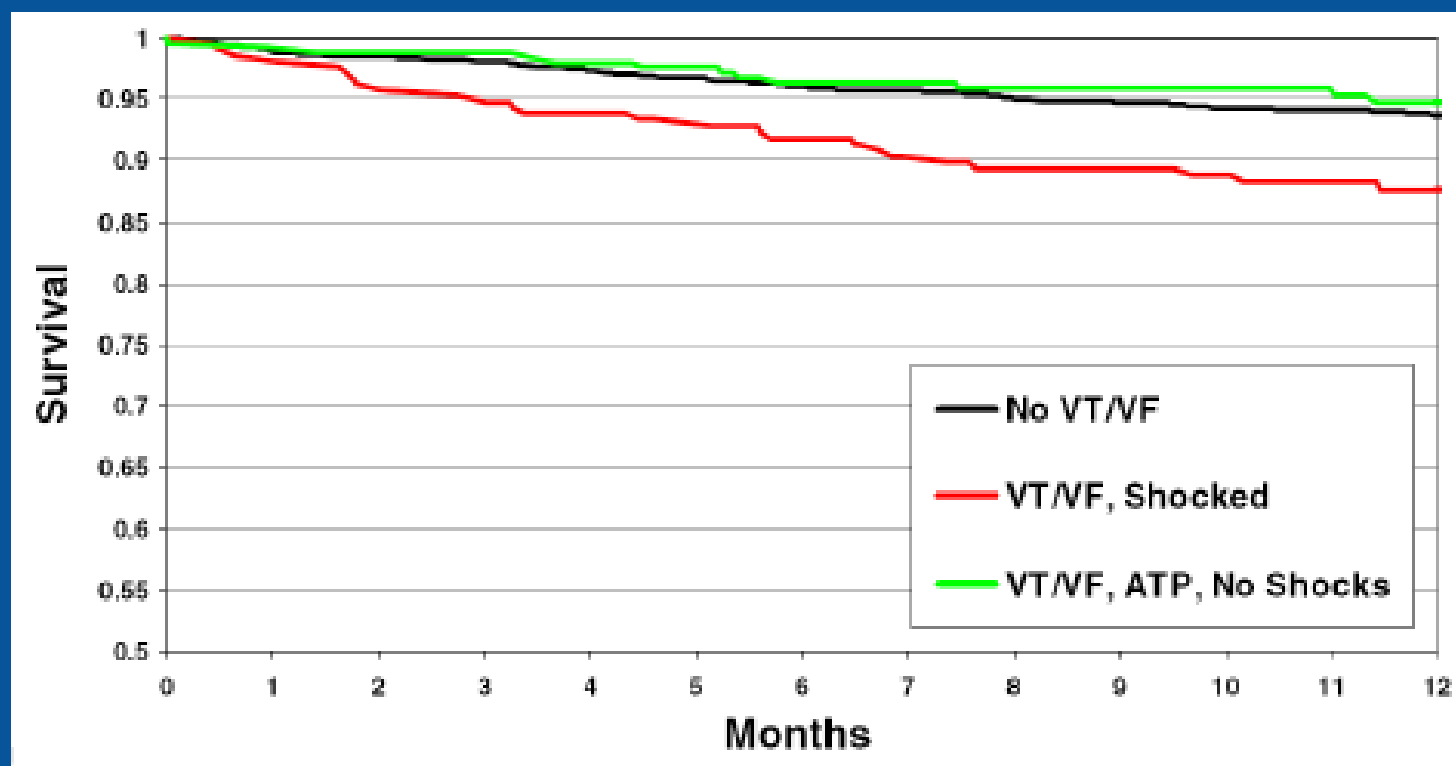
- **Meta Analysis of inappropriate shocks in 1,544 ICD pts.:**
  - Incidence: 7% at 1 y, 13% at 3 y, 18% at 5 years
  - Causes: SVT (76% of pts.)
  - Predictors: History of AF, age <70 y, appropriate shocks, no statin
  - Outcome: Associated with higher mortality

## Predictors of all-cause mortality

	Univariate			Multivariate		
	HR	95% CI	p Value	HR	95% CI	p Value
<b>Baseline variables</b>						
History of atrial fibrillation <sup>a</sup>	1.3	1.0-1.7	0.11	1.4	1.0-1.7	<0.01
Age >70 yrs <sup>a</sup>	2.7	2.2-3.4	<0.01	1.9	1.5-2.5	<0.01
NYHA functional class >II <sup>a</sup>	2.0	1.6-1.6	<0.01	1.5	1.1-1.9	0.03
Renal clearance <30 ml/min <sup>a</sup>	2.7	2.0-3.7	<0.01	1.7	1.2-2.4	0.02
QRS duration >120 ms <sup>a</sup>	2.0	1.6-2.6	<0.01	1.4	1.1-1.8	0.02
No use of beta-blockers <sup>a</sup>	1.3	1.0-1.7	0.01			
<b>Interim events</b>						
Inappropriate shock	1.4	1.0-2.0	0.07	1.6	1.1-2.3	0.01
Per inappropriate shocks (≥5) <sup>†</sup>	1.3	1.1-1.6	<0.01	1.4	1.2-1.7	<0.01
Interim appropriate shocks <sup>a</sup>	2.5	1.9-3.3	<0.01	1.6	1.2-2.1	<0.01

# Shocks but not ATP are associated with Higher Mortality

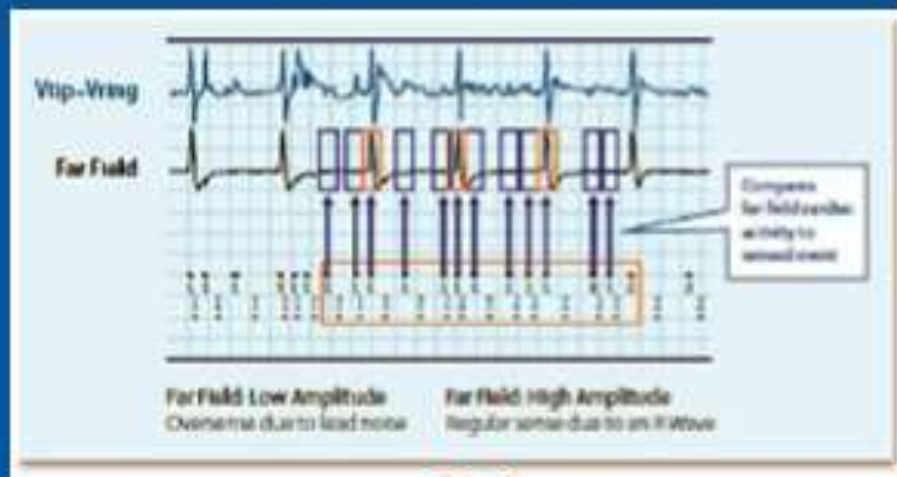
- Retrospective analysis of pooled data
  - PainFREE I and II, EMPIRIC and PREPARE
  - 2,135 pts, EF 31%, 87% CAD, 55% NYHA II/III, 42% NYHA I/ no CHF



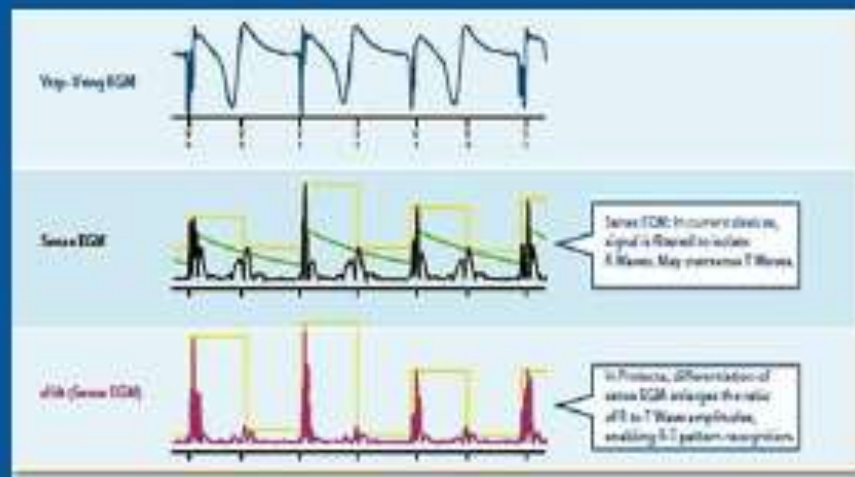
# Potential Benefits of Shock Reduction

- Improved patient quality of life
- Increased ICD therapy acceptance
- Extended ICD longevity
- Less demand for post-shock care
- May improve survival benefits of ICDs
- Reduced healthcare spending

# Programming Strategies to Safely Reduce Shocks

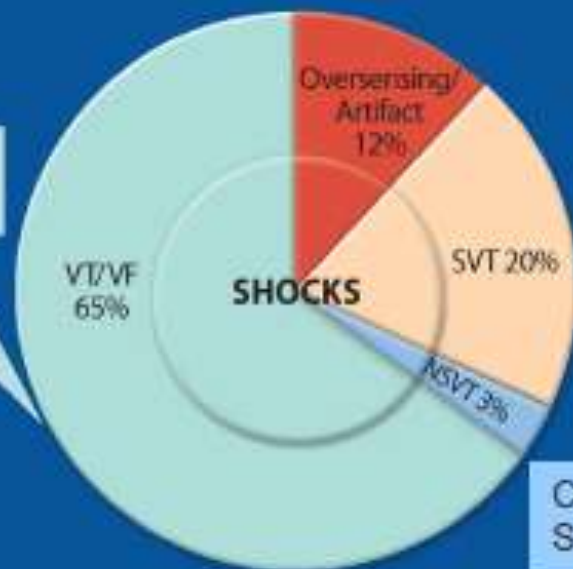


Noise



T wave

ATP Before and During Charging



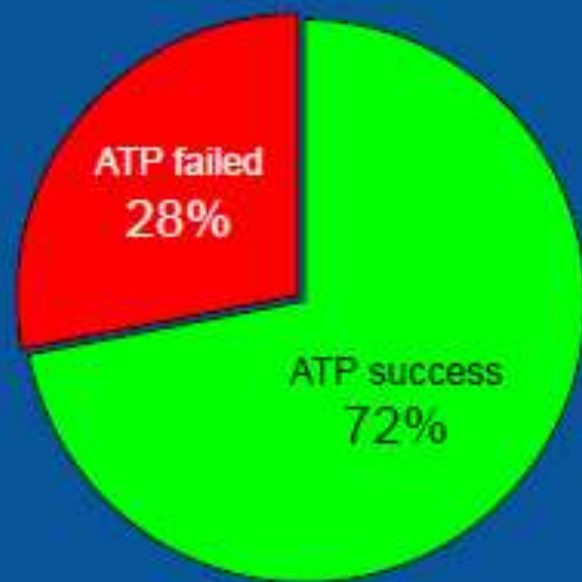
PR logic AND wavelet analysis

Confirmation Plus; Short charge time

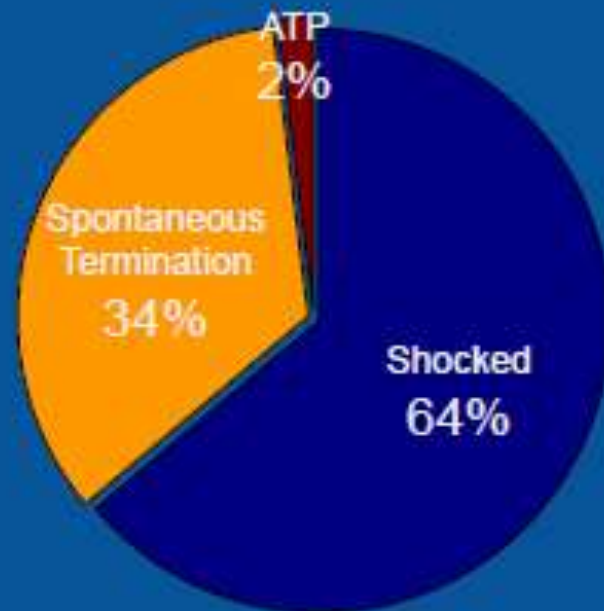
SCDHeFT data

# ATP for Fast VTs Reduces Shocks

- PainFREE Rx II: 634 prim./sec. prevention ICD pts. randomized to empirical ATP or shock for fast VTs (188-250 bpm), NID 18/24
- ATP is highly effective, equally safe and improves QoL



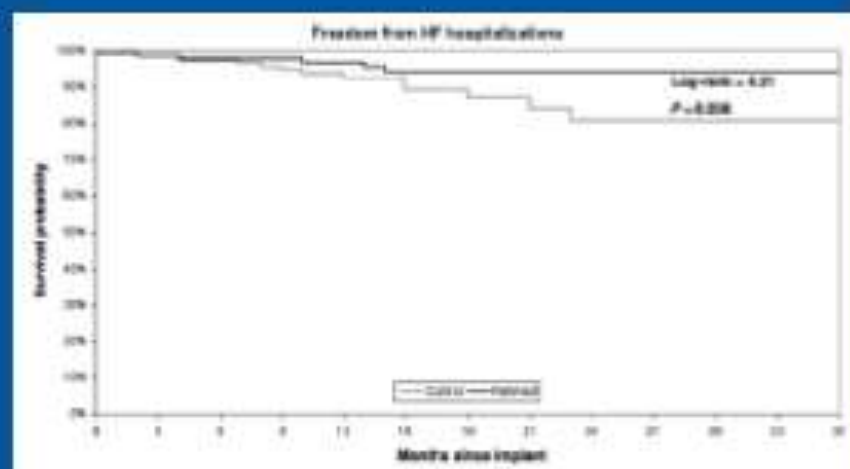
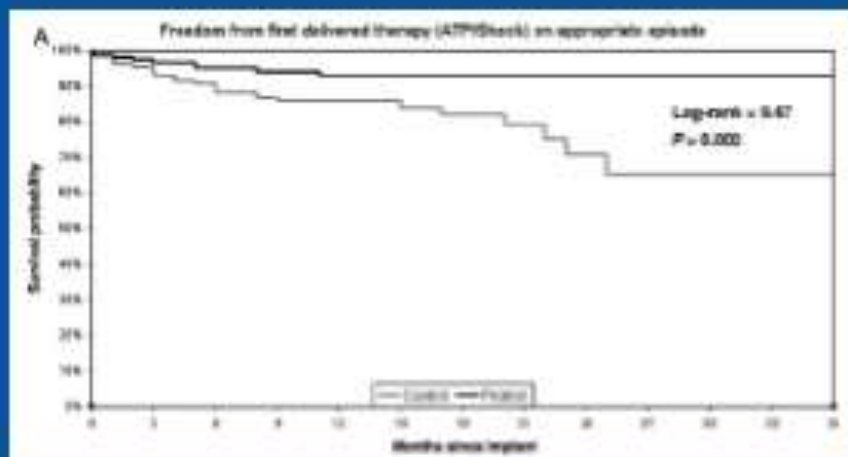
ATP Arm  
n=284 episodes



Shock Arm  
n=147 episodes

# CRT-D with NID programmed to 30/40

- **RELEVANT:** 324 primary prevention pts. with non-ischemic etiology with CRT-D programmed to: NID 30/40 or 12/16 (control)
- **Study arm showed:**
  - Better event-free survival to first delivered therapy for total, appropriate and inappropriate episodes
  - Lower total number of delivered shocks
  - Reduced HF hospitalization



# Lots of Data and Experience Now Suggest

**For Primary Prevention Patients:**

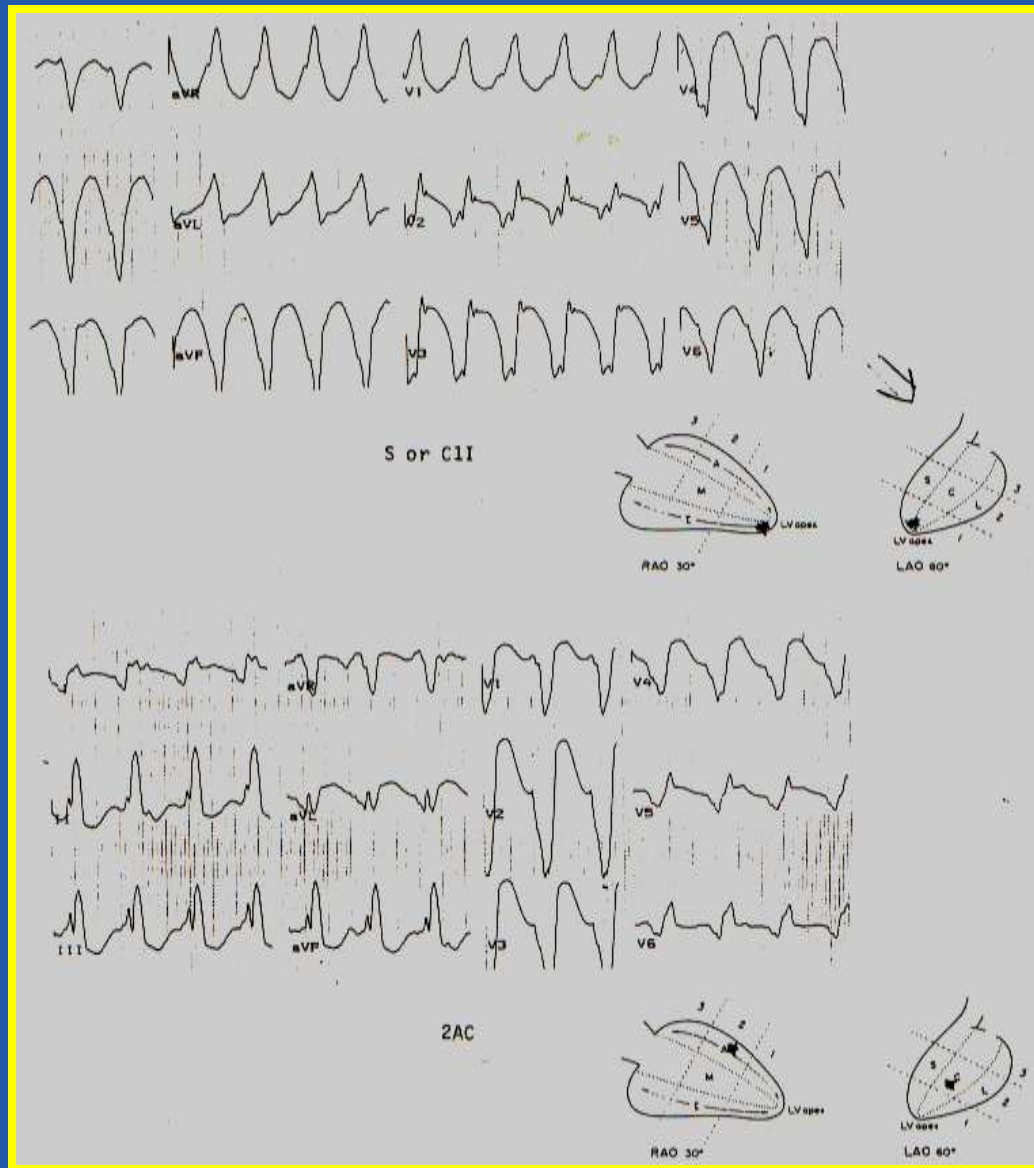
**Use of ATP**

**Prolonged Detection**

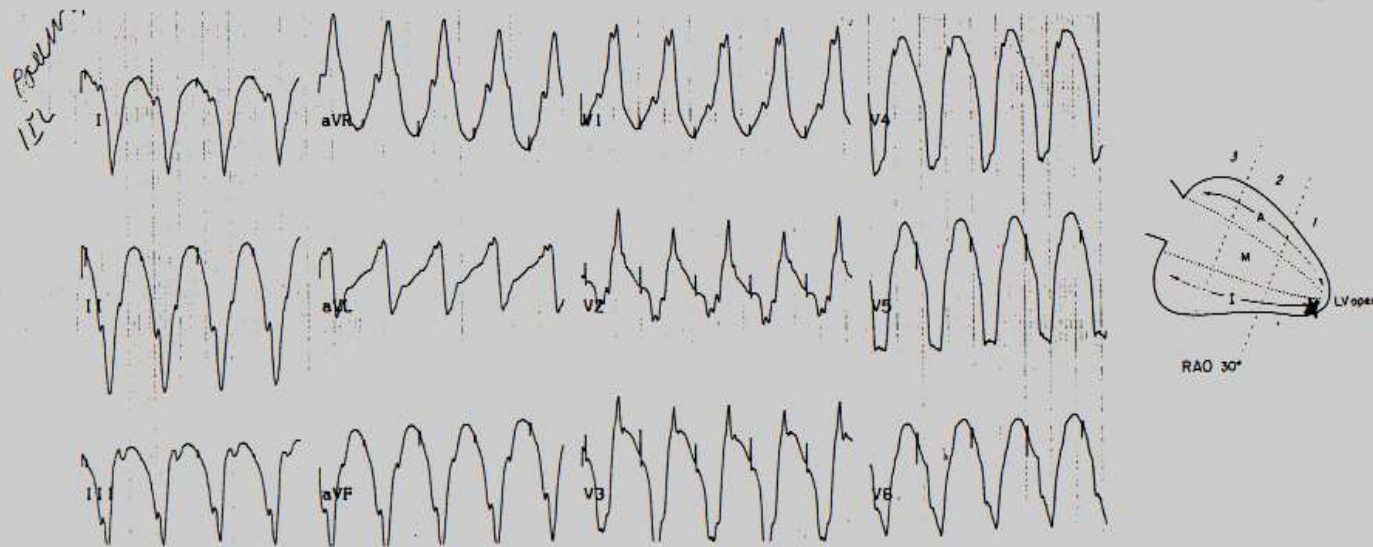
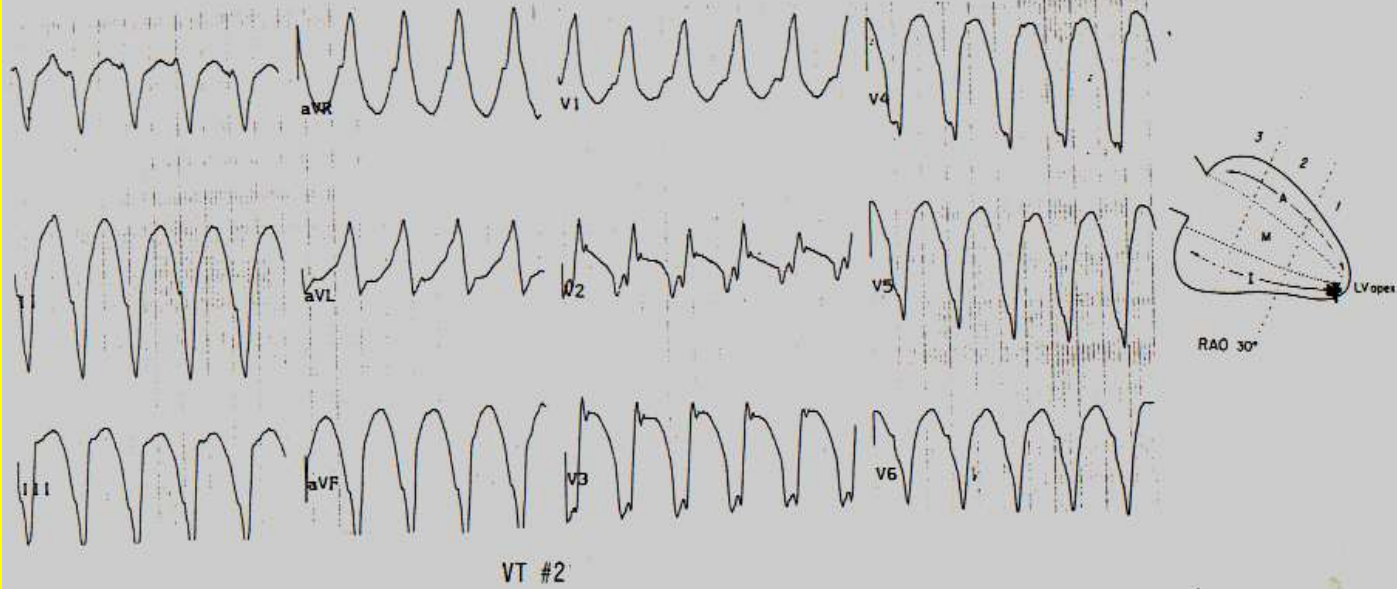


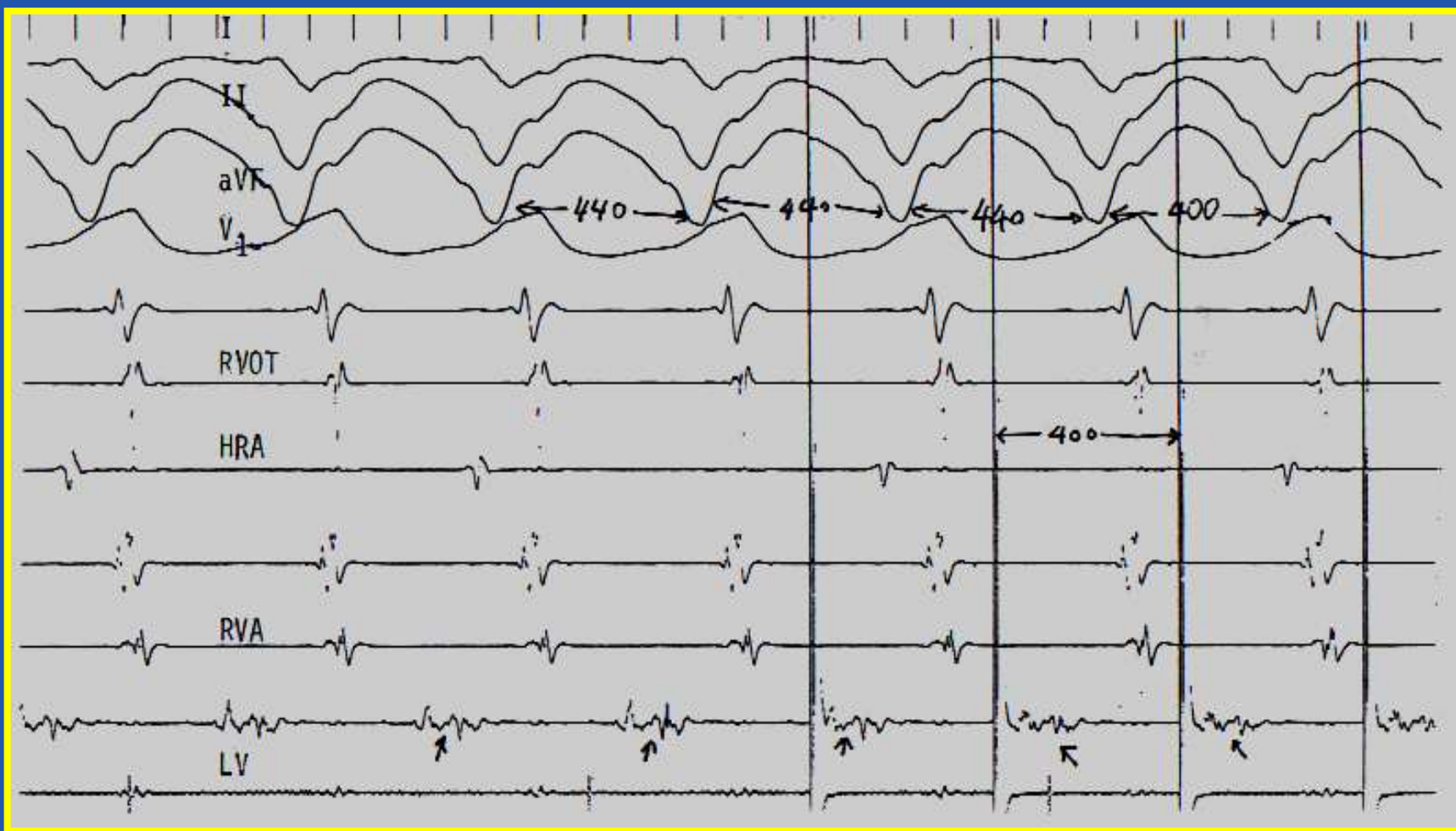
**Reduced Shocks in ICD patients**

# Patient 70 years, male, IWMI and recurrent sustained VT refractory to Amiodarone

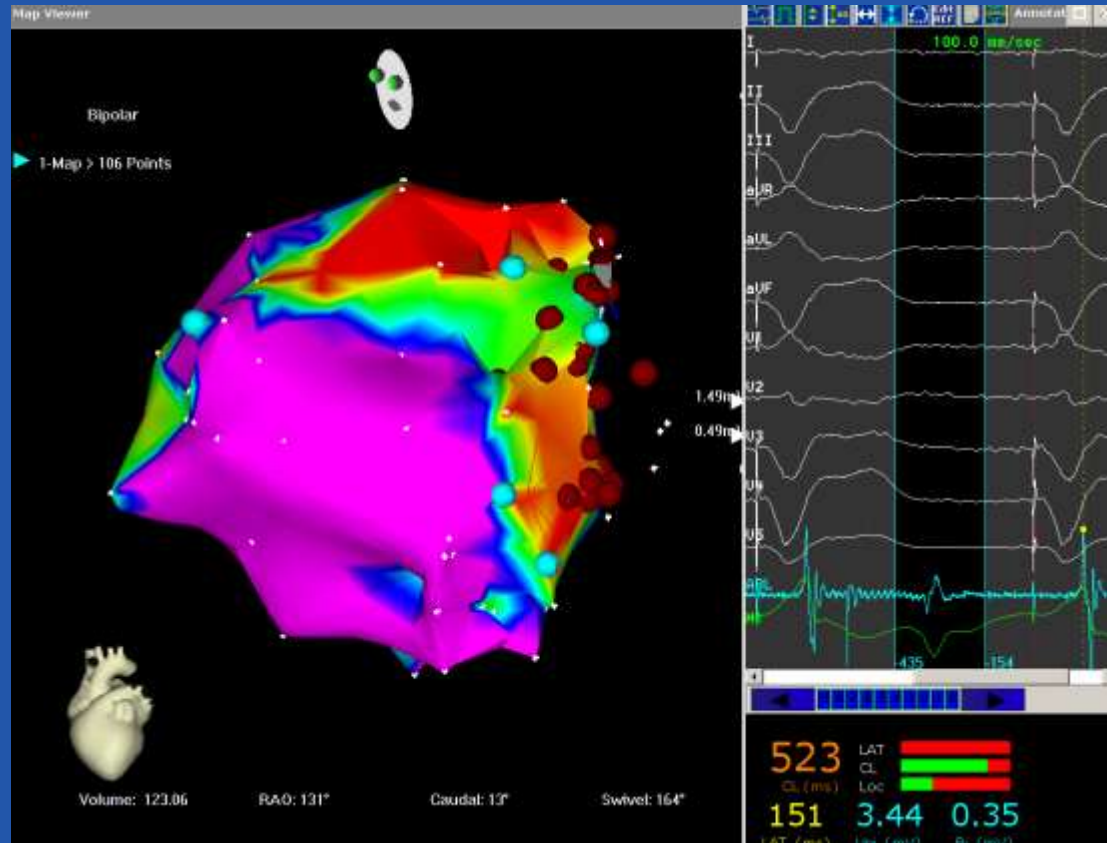


# Pace map (site I1L)





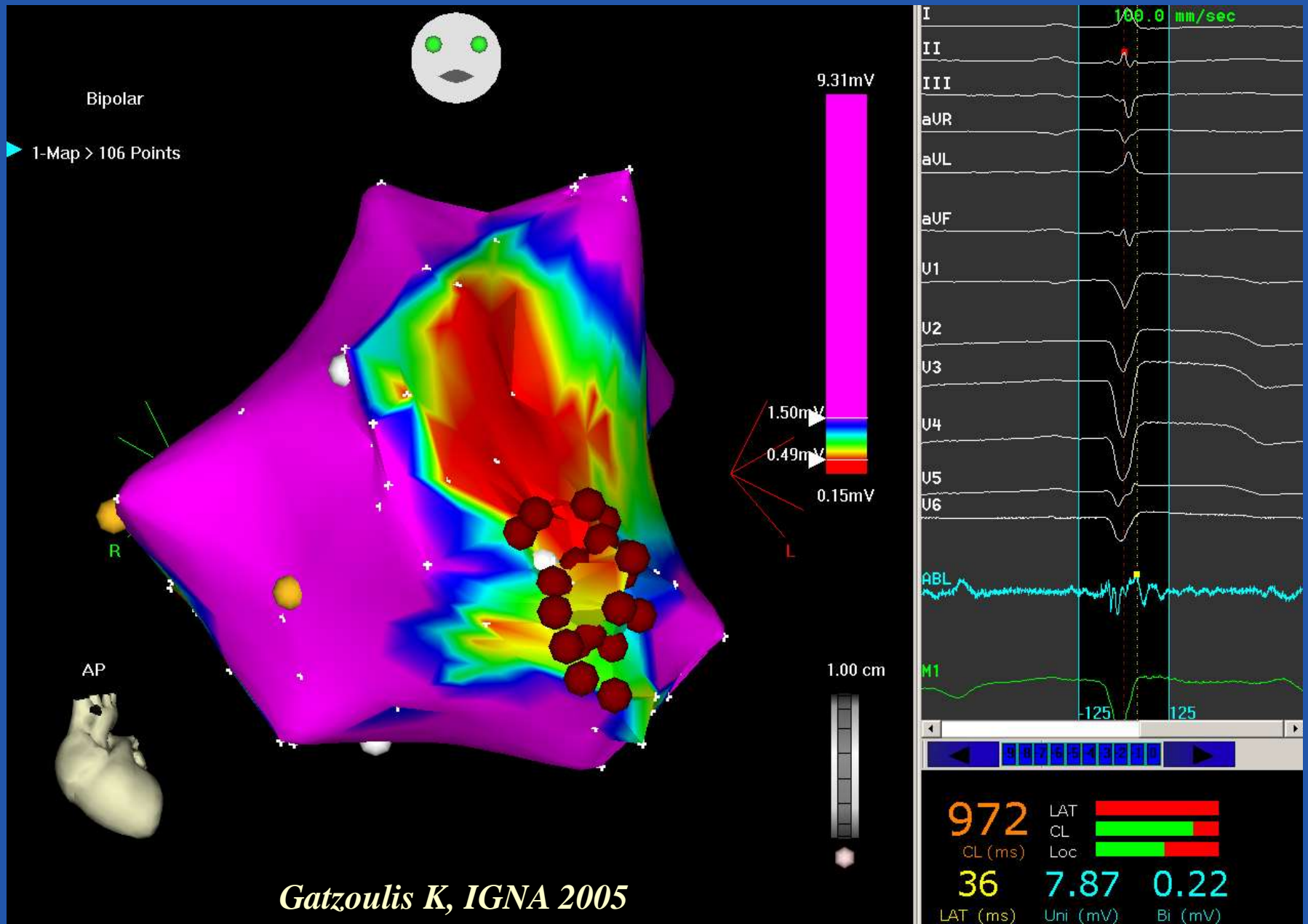
Χάρτης δυναμικών της αριστερής κοιλίας. Στον καθετήρα κατάλυσης (ABL) και επί κοιλιακής βηματοδότησης καταγράφεται όψιμο δυναμικό και μεσοδιαστολικό δυναμικό στη ζώνη βραδείας αγωγής.



Γκατζούλης ΚΑ και συν., Καρδιολογικά Θέματα, 2006

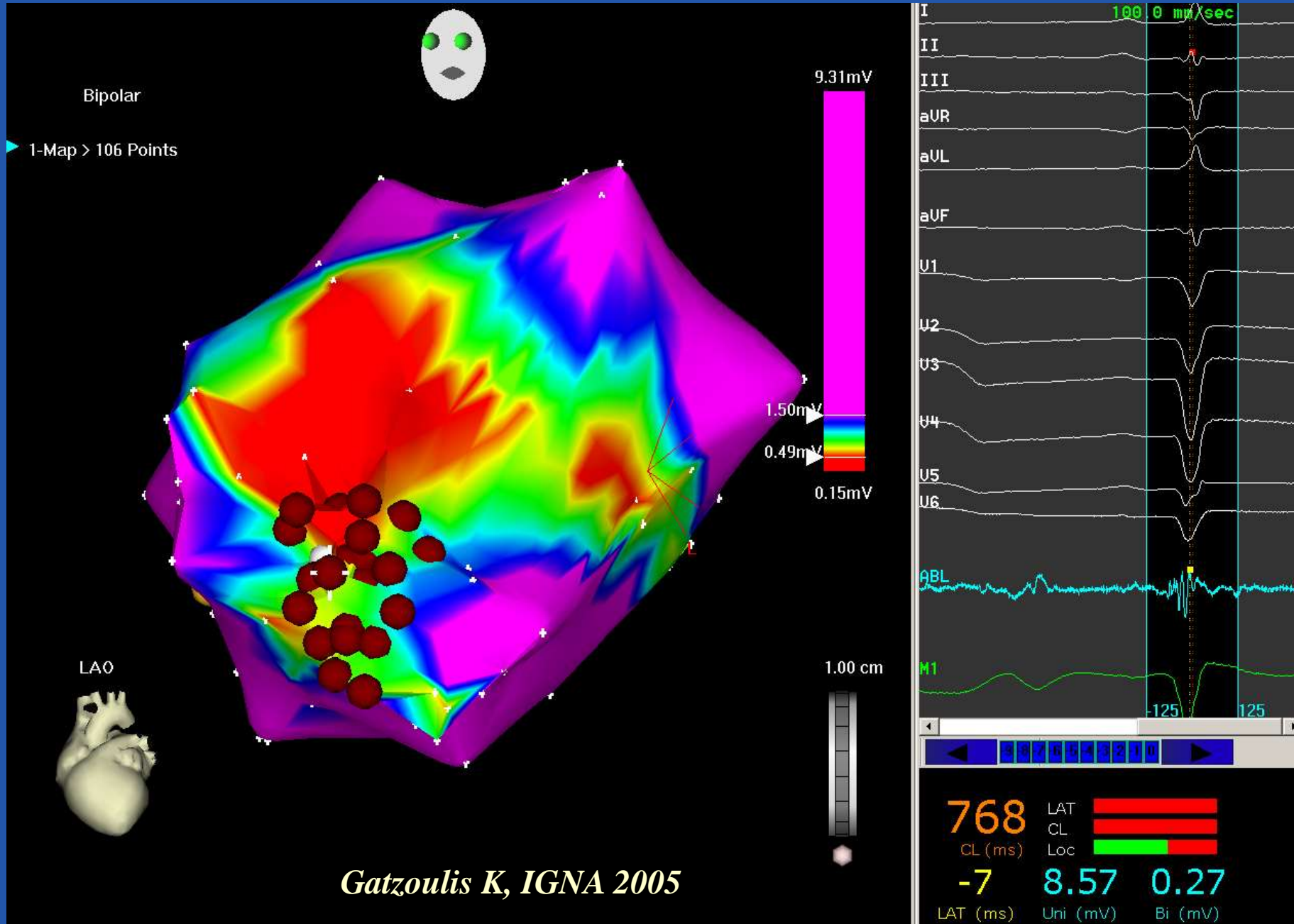


**58 y/o WM with ES 12 years after the first MI.  
LPs are present in low voltage slow conducting zone of the LV.**



*Gatzoulis K, IGNA 2005*

# 58 y/o WM with ES 12 years post-MI. Middiastolic electrograms in low voltage slow conducting zone of the LV.



*Gatzoulis K, IGNA 2005*

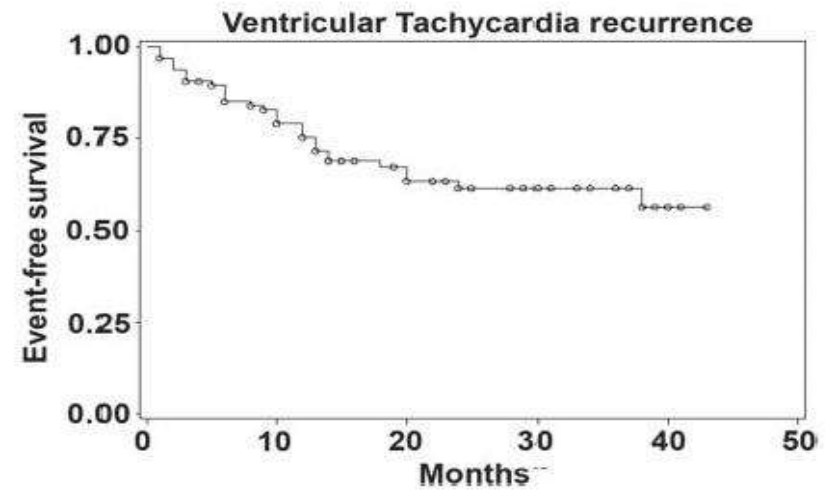
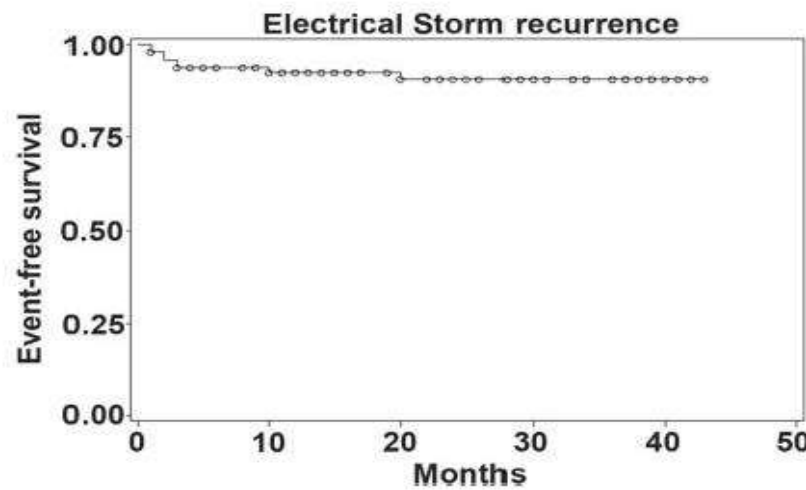
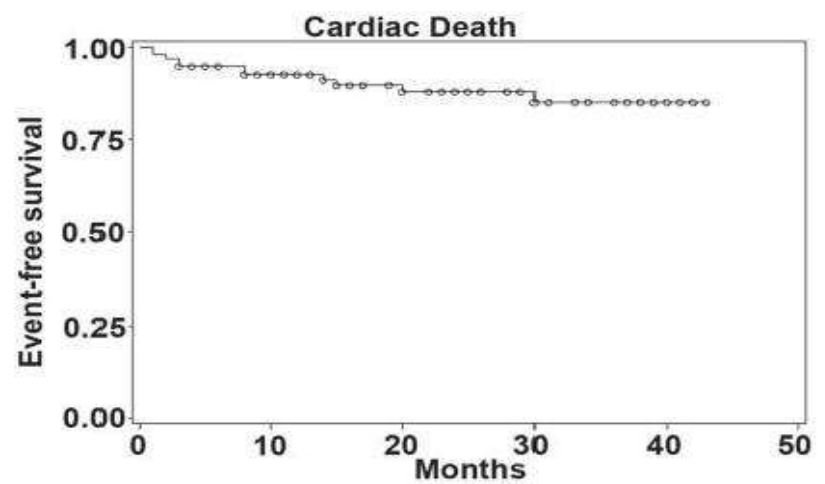
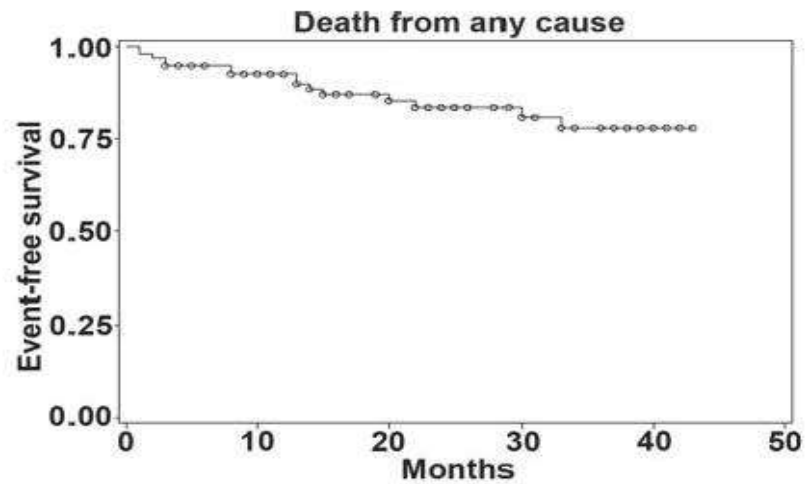


Figure 1. Kaplan-Meier event-free survival estimates in patient population during follow up.

*Carbucicchio C, Santamaria M, et al, Circulation, 2008 Jan 29;117(4):462-469*

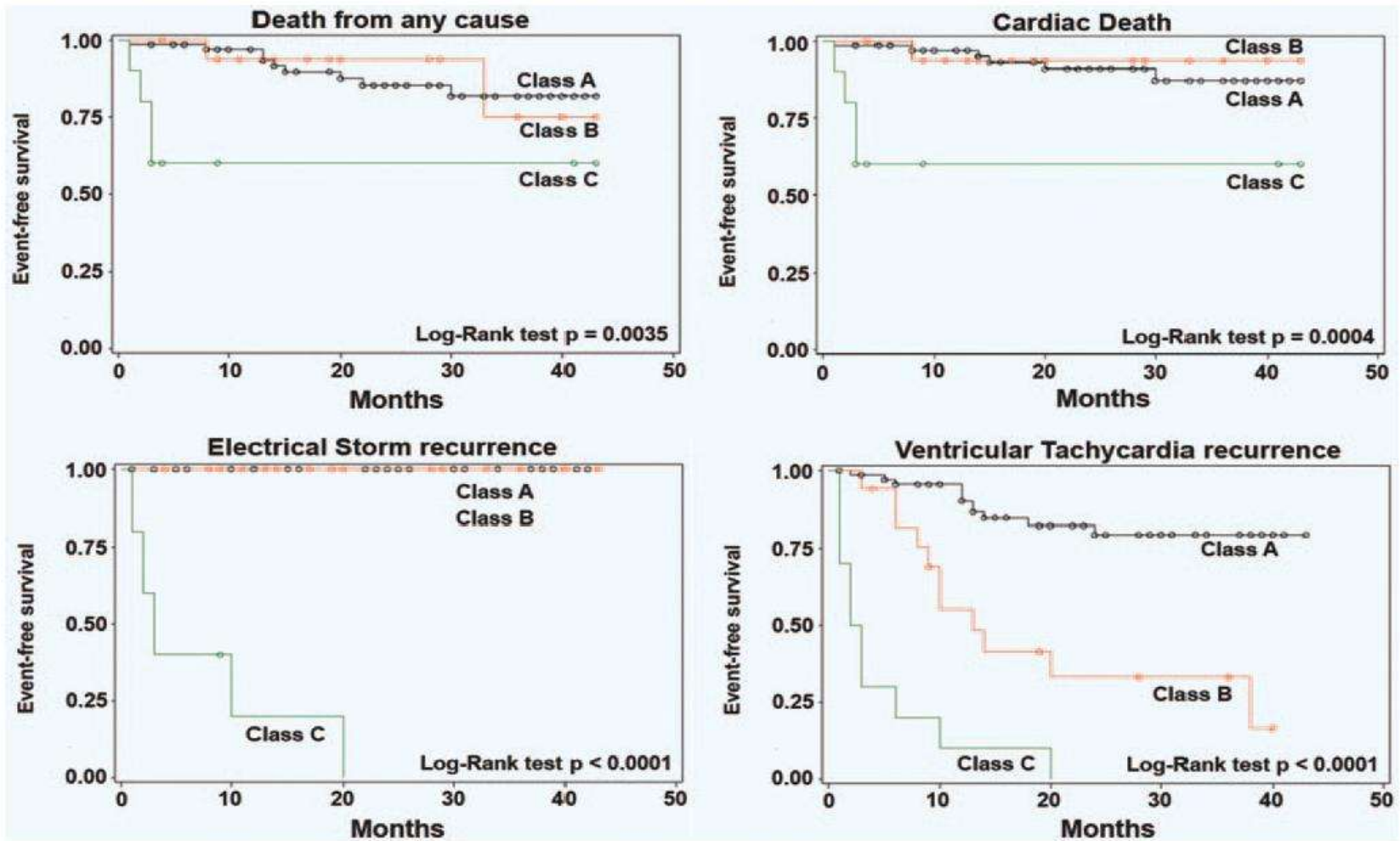
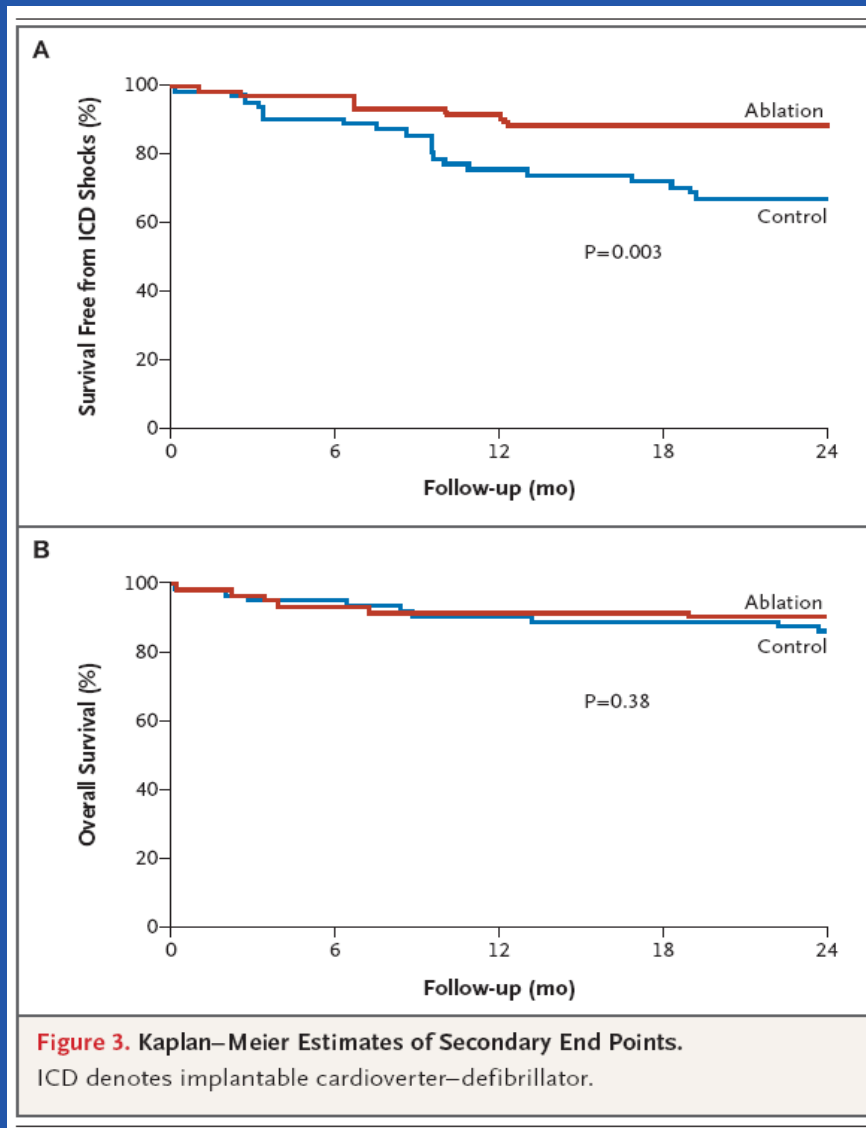


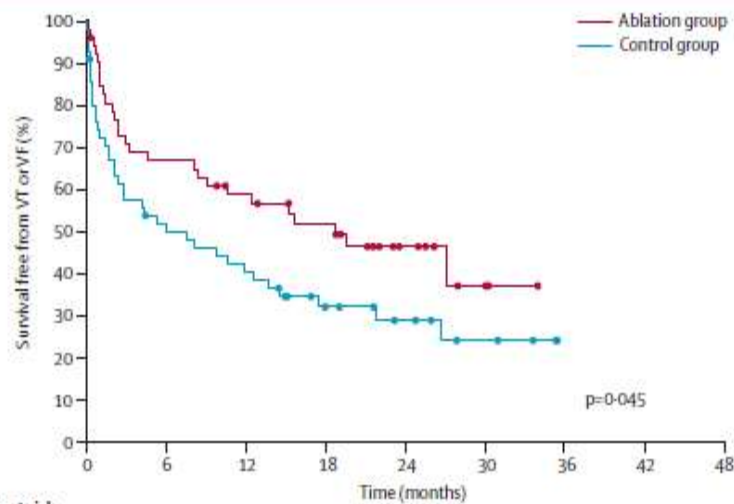
Figure 2. Kaplan-Meier event-free survival estimates according to acute CA results during follow up. Class A indicates CA success; class B, CA partial success; and class C, CA failure.

*Carbucicchio C, Santamaria M, et al, Circulation, 2008 Jan 29;117(4):462-469*

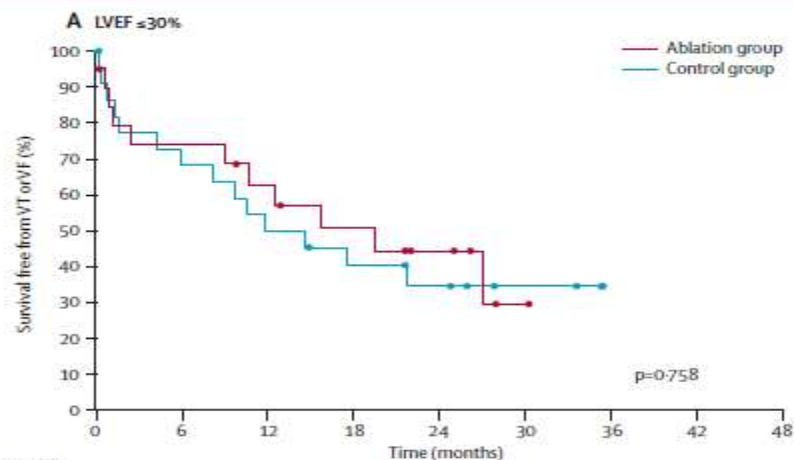


*Reddy VY, Reynolds MR, et al, N Engl J Med, 2007 Dec 27;357(26):2717-9*

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

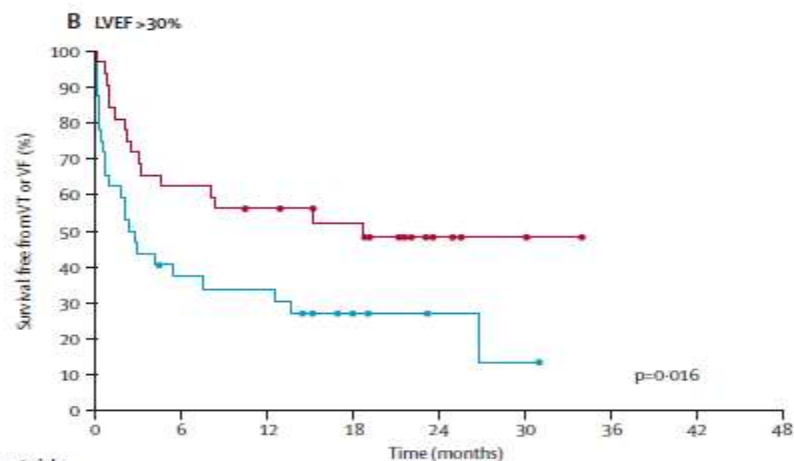


**Figure 2: Kaplan-Meier curves for the primary endpoint**  
Estimates for survival free from ventricular tachycardia (VT) or ventricular fibrillation (VF). Censored patients are indicated by dots. The p value was calculated by log-rank test.



**Number at risk**

	0	6	12	18	24	30	36
Ablation group	20	14	11	8	5	1	0
Control group	23	15	11	8	6	3	0



**Figure 3: Kaplan-Meier curves for the primary endpoint by left-ventricular function**  
Graphs show estimates for survival free from ventricular tachycardia (VT) or ventricular fibrillation (VF) in patients with (A) left-ventricular ejection fraction (LVEF) of 30% or less and (B) left-ventricular ejection fraction more than 30%. Censored patients are indicated by dots. The p value was calculated by log-rank test.

A landscape photograph featuring a wide, calm lake in the middle ground, with rolling hills and mountains in the background. A vibrant rainbow arches across the sky, which is filled with soft, grey clouds. The foreground is dominated by a dense line of evergreen and deciduous trees, some with autumn-colored foliage. The overall mood is serene and peaceful.

*Thank you*