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October
25th-27th
2018
Starhotels
Majestic

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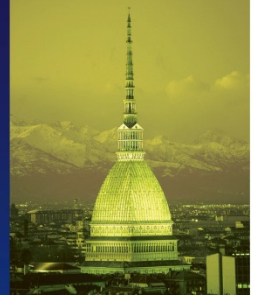
TORINESI



UNIVERSITÁ DEGLI STUDI DI TORINO

AZIENDA OSPEDALIERO - UNIVERSITARIA
Città della Salute e della Scienza di Torino

The ECG: A forgotten Tool for Risk Stratification

Prof. Dr. Martin Borggrefe
Mannheim

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Medizinische Fakultät Mannheim
der Universität Heidelberg

Universitätsklinikum Mannheim

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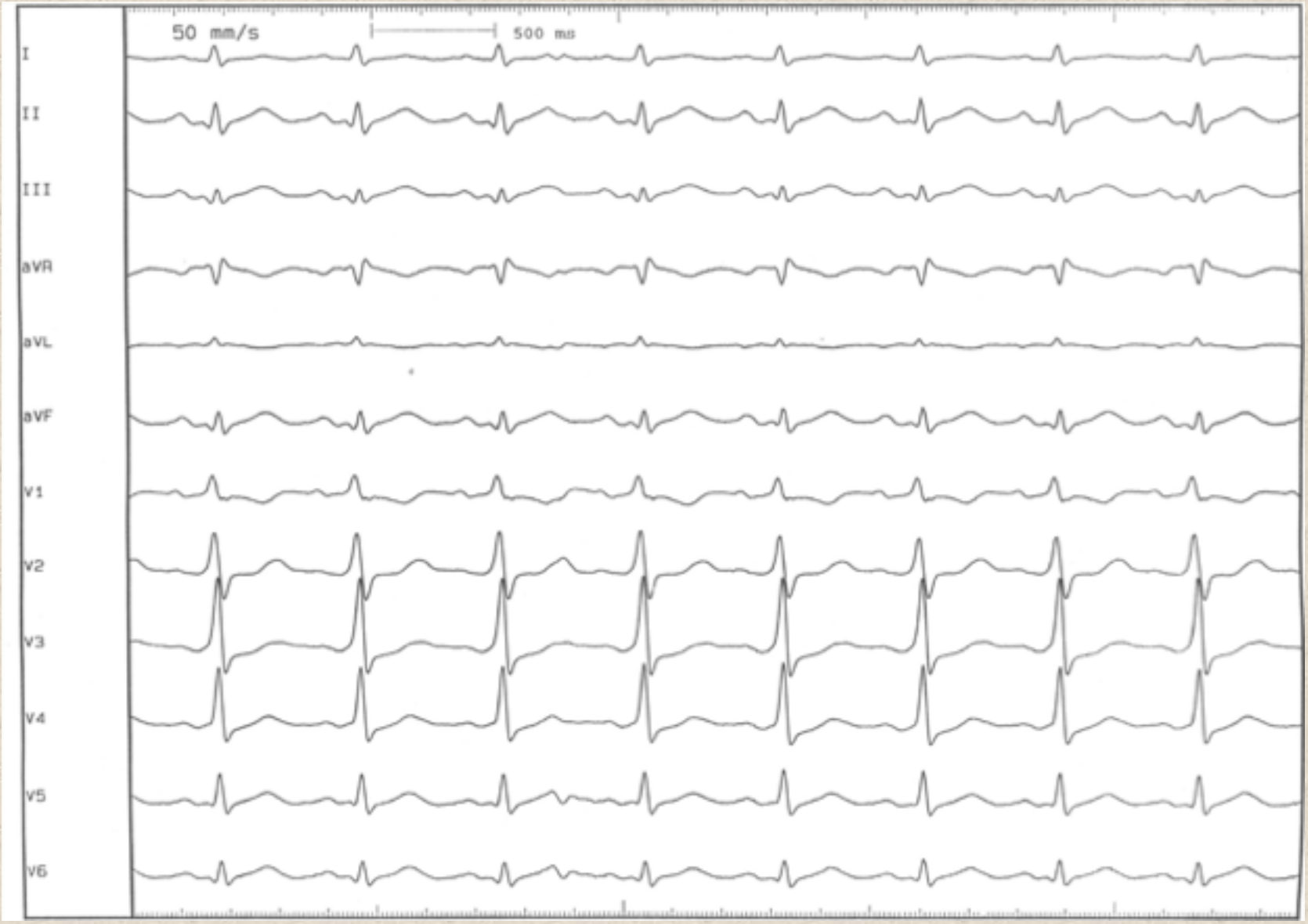
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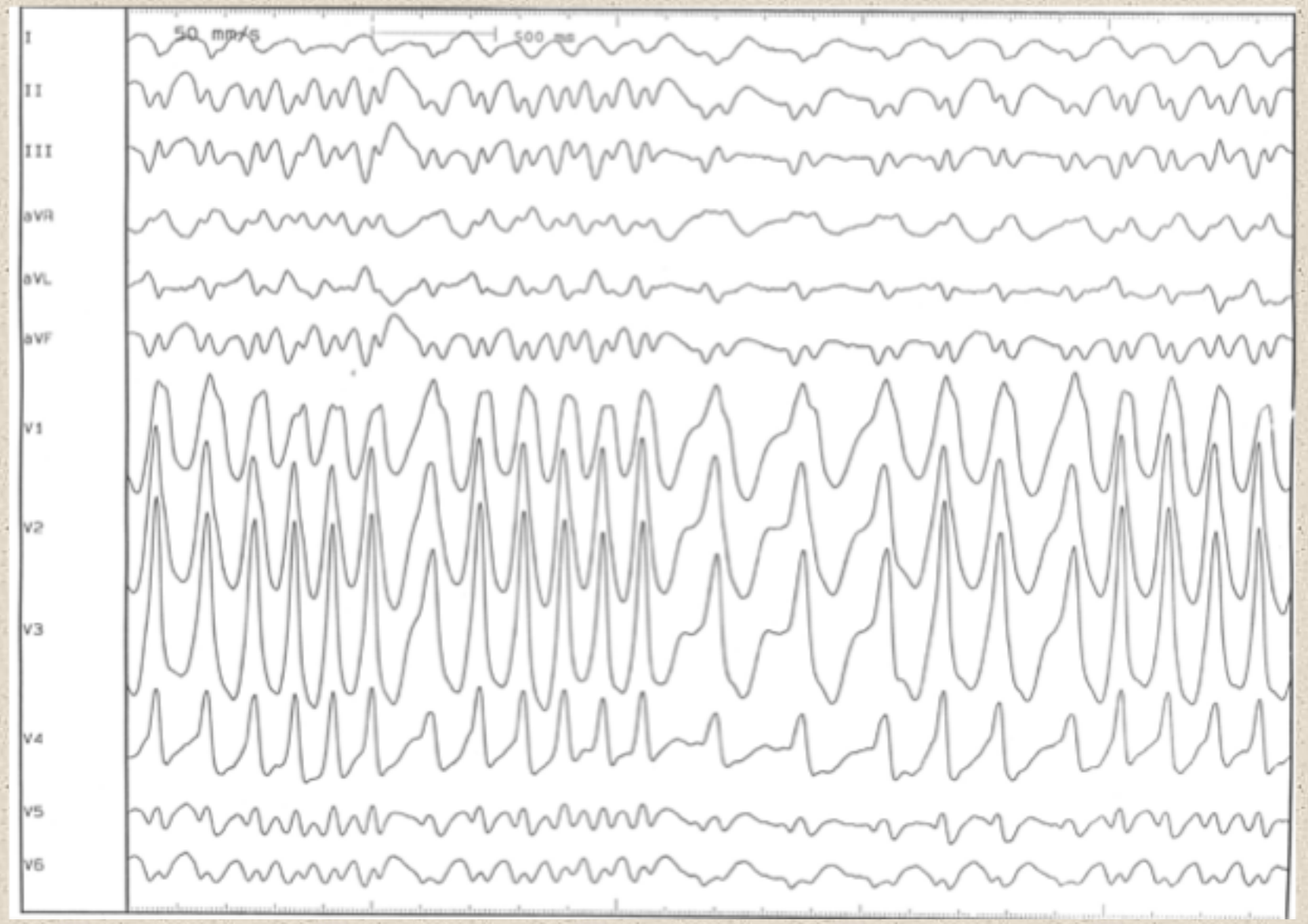
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pre

50 mm/s
500 ms
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aVL
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V5
V6

post

50 mm/s
500 ms
I
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V1
V2
V3
V4
V5
V6

Sudden death in WPW syndrome

85% male gender

shortest RR during AF ≤ 220 ms

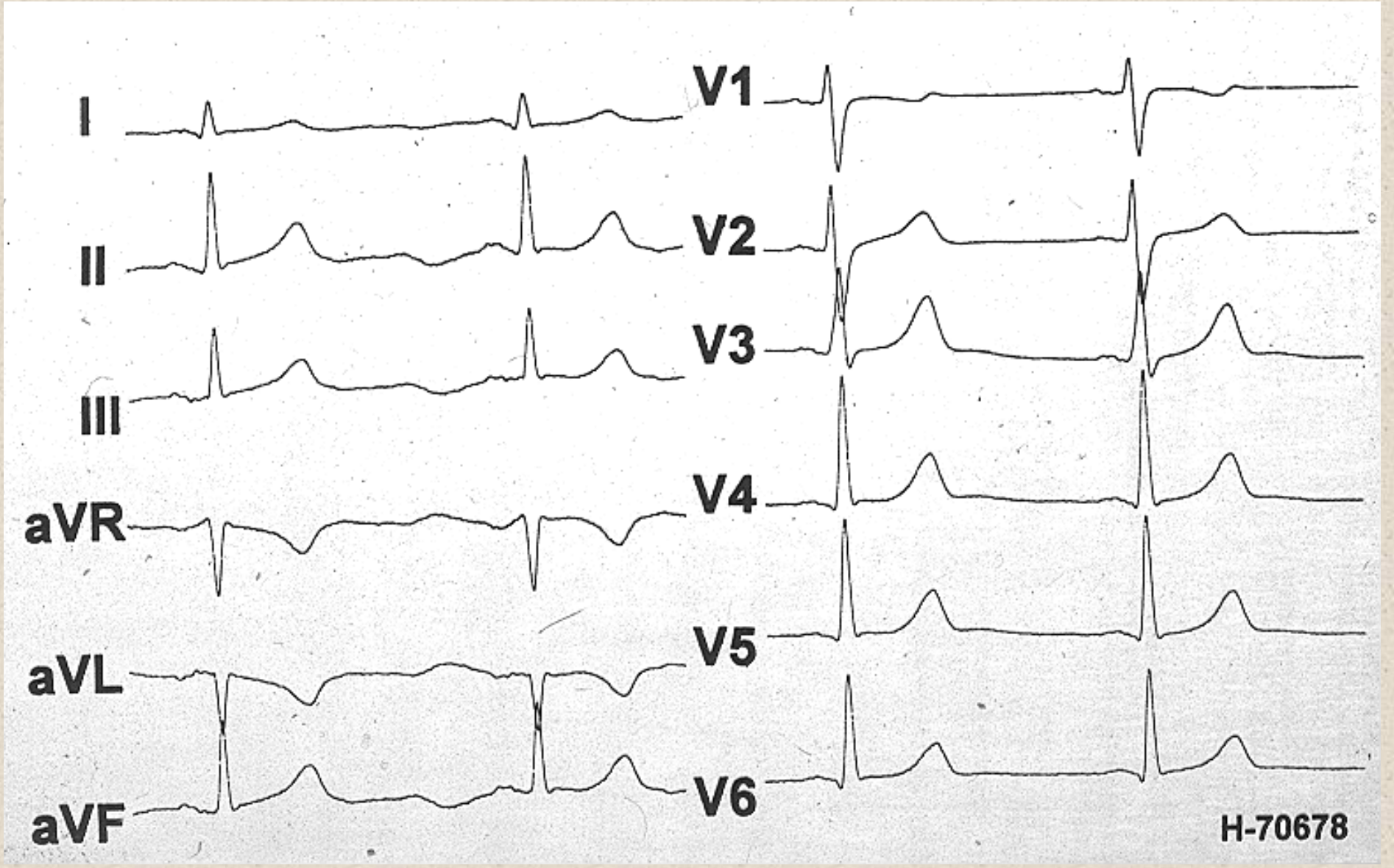
septal AP location

high catecholamine state

---

multiple AP‘s

digitalis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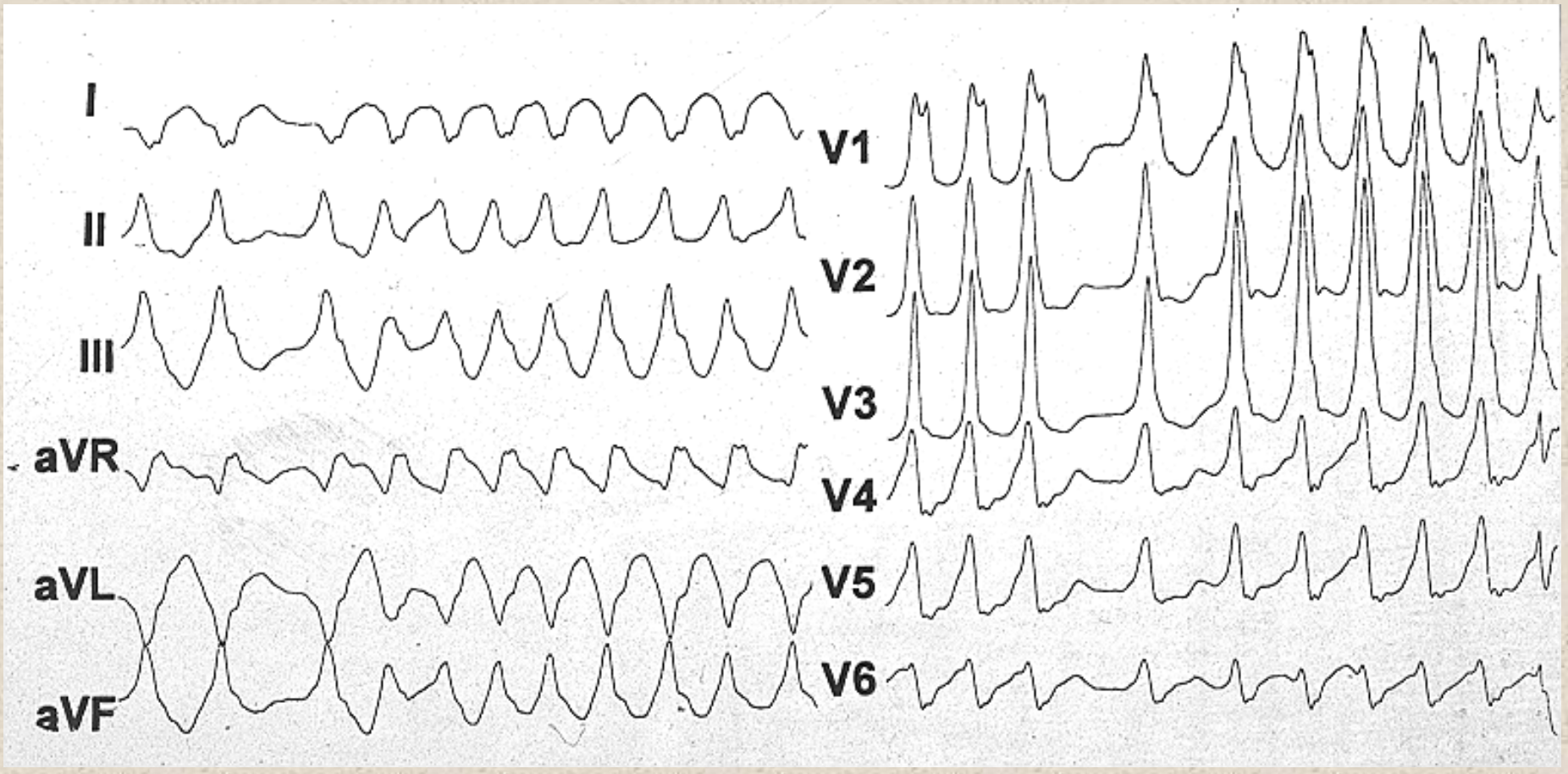
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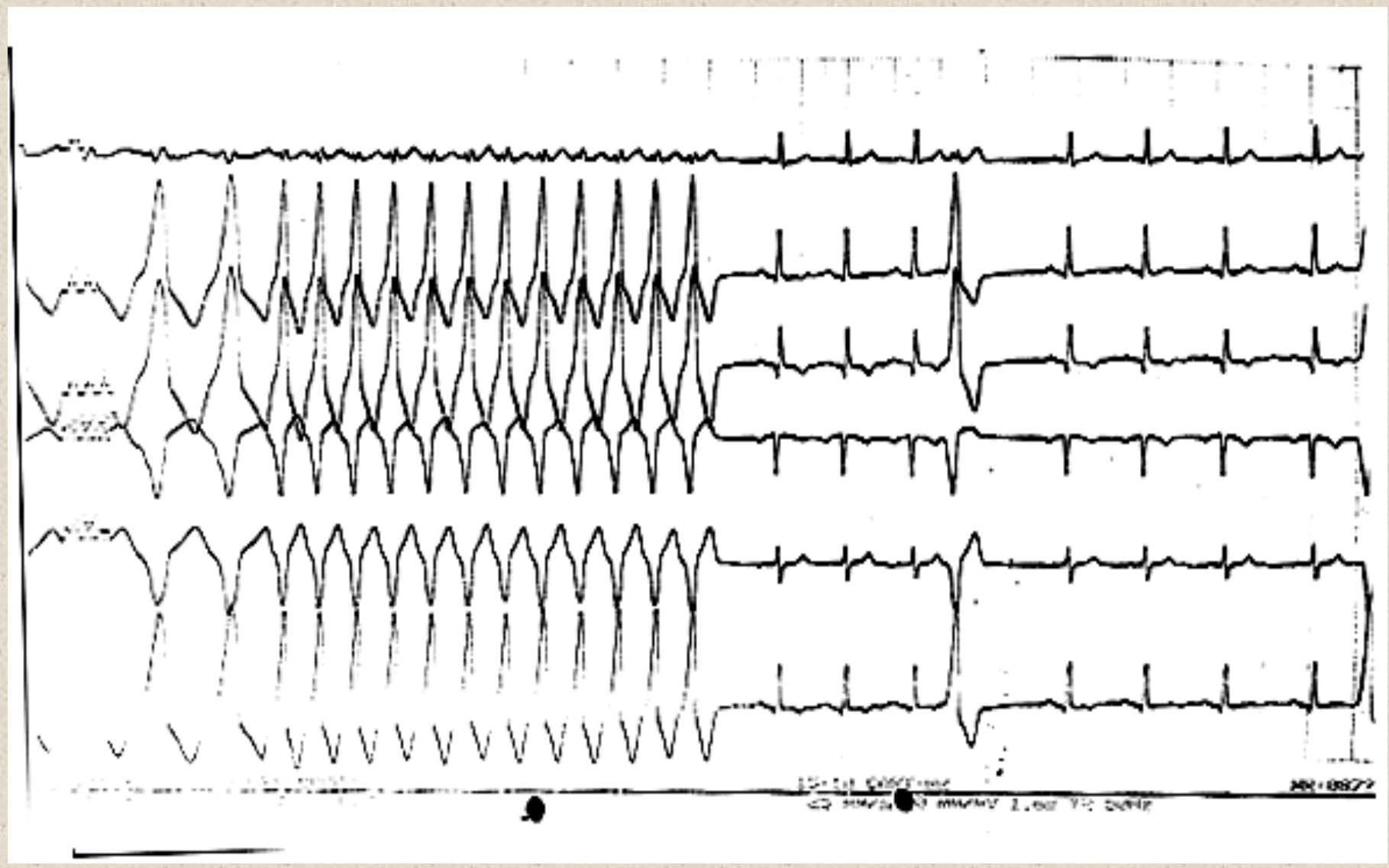
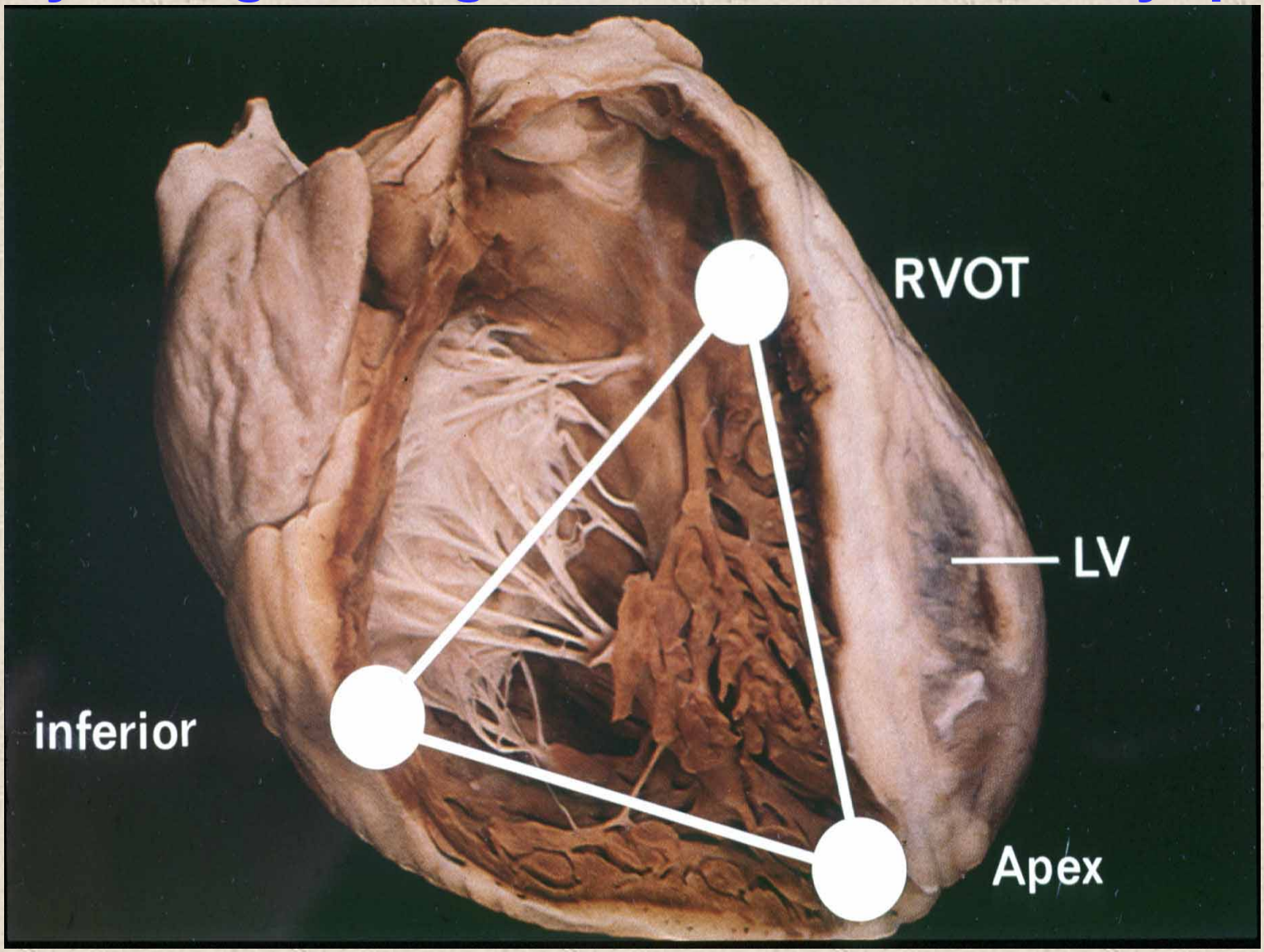
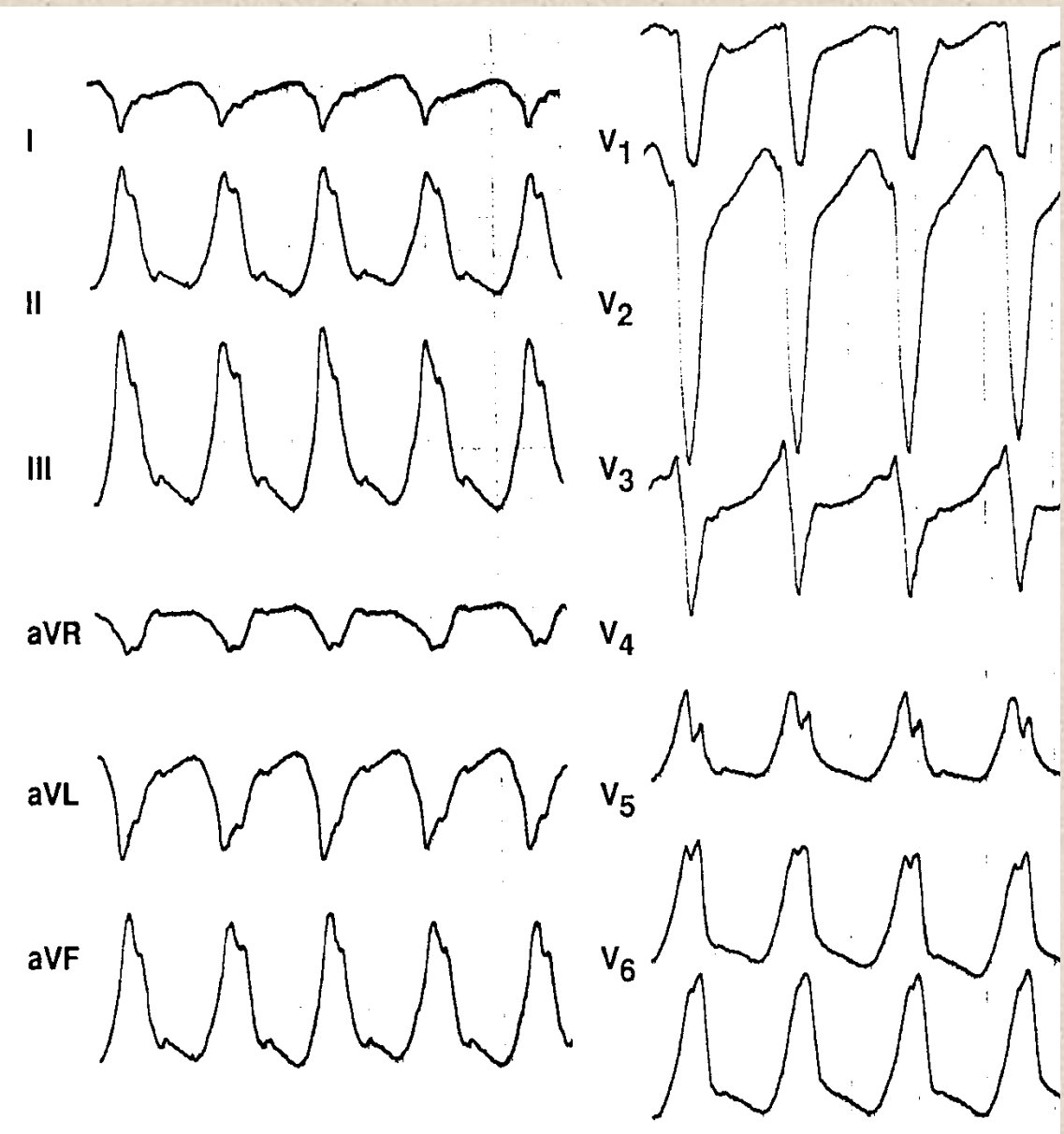


Idiopathic RV VT

Arrhythmogenic right ventricular cardiomyopathy

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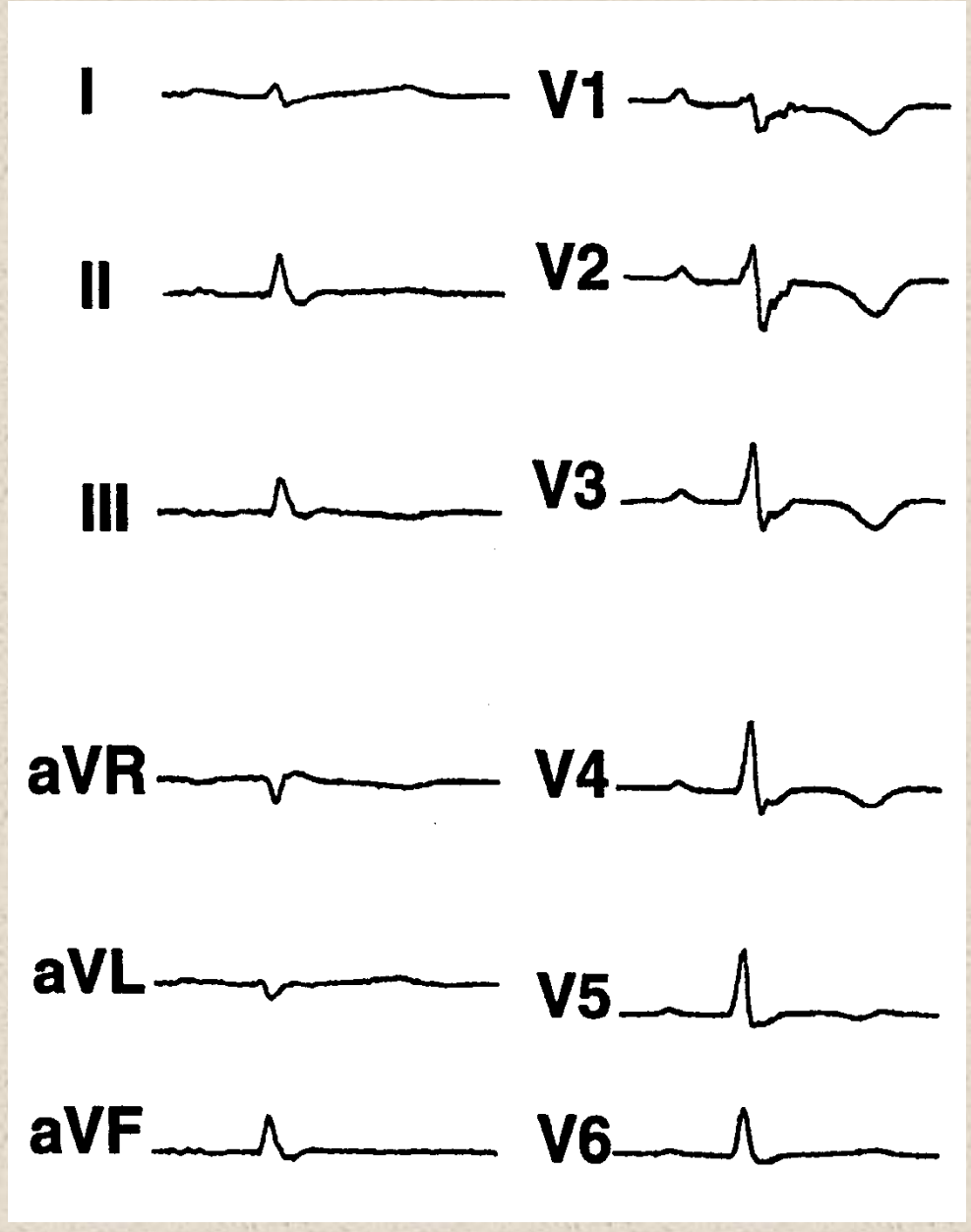
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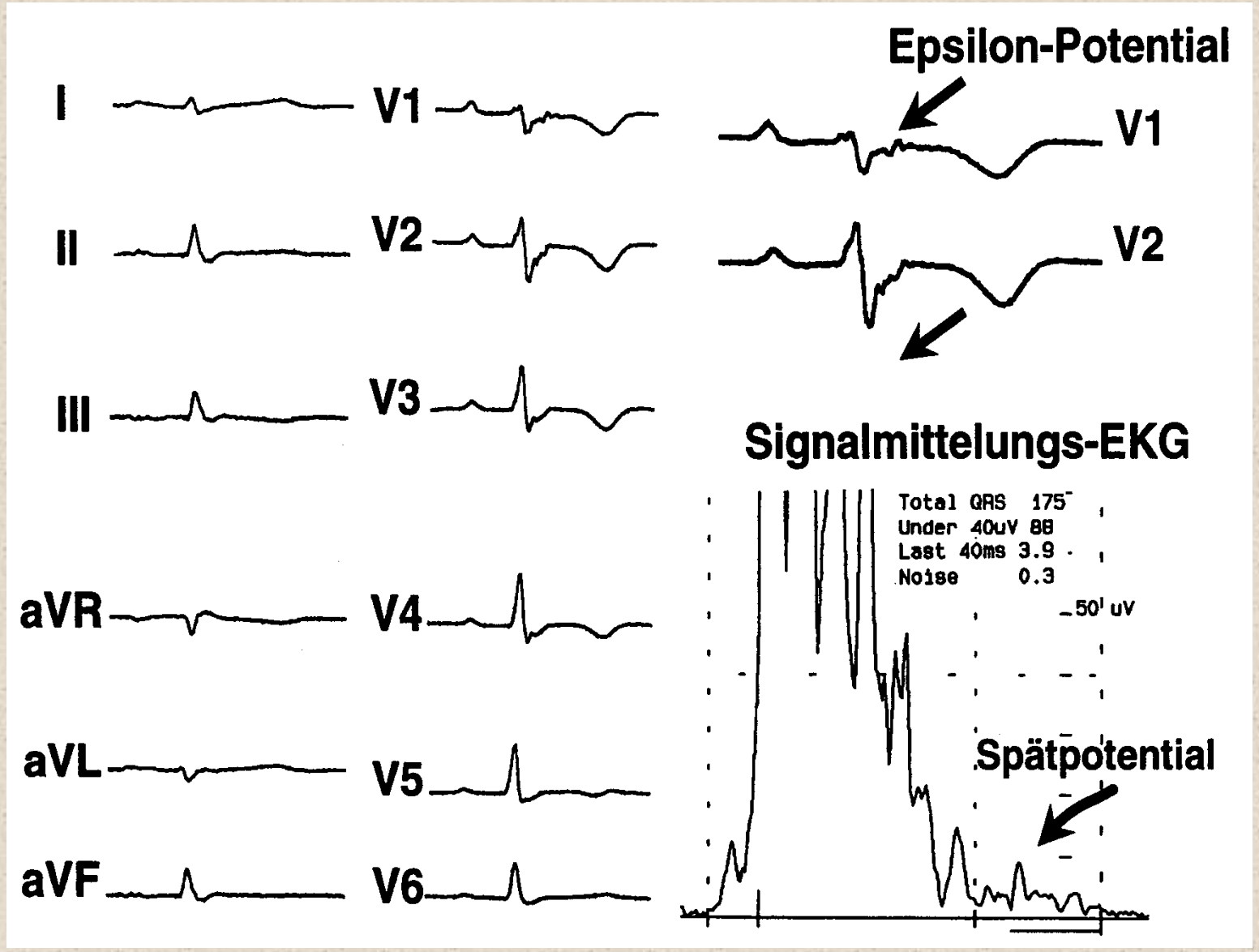
I
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Epsilon-Potential
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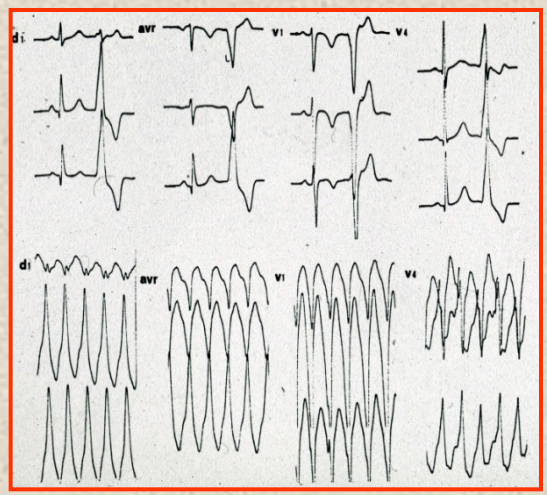
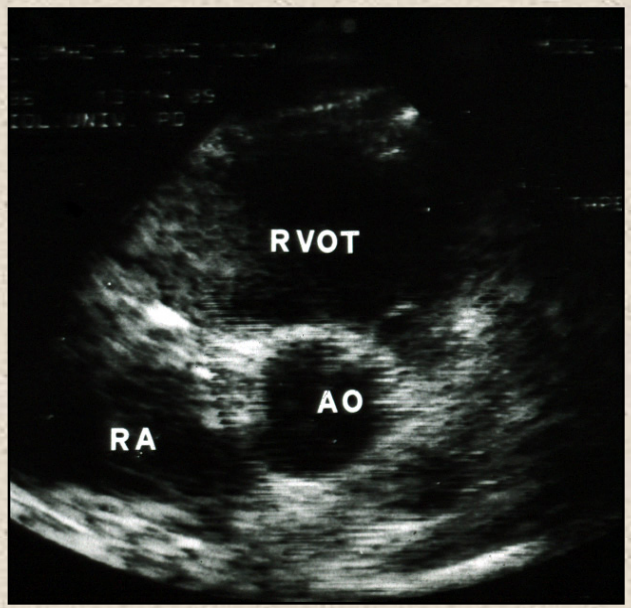
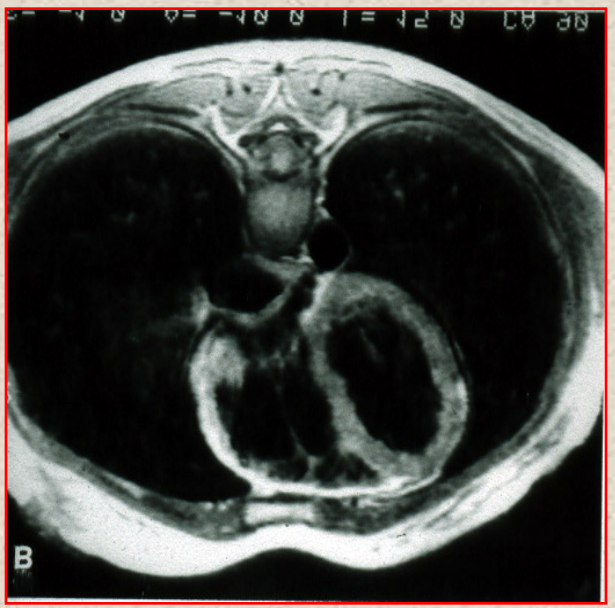
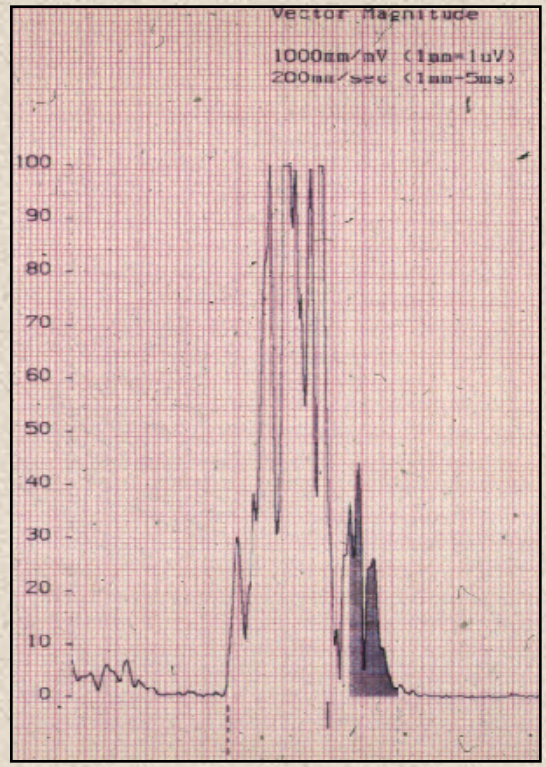
Signalmittelungs-EKG
Total QRS 175
Under 40uV 88
Last 40ms 3.9
Noise 0.3
50 uV
Spätpotential

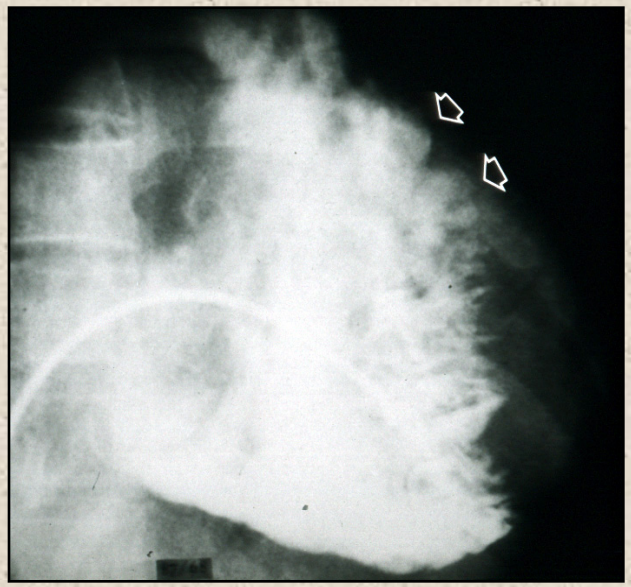
ARVD/C phenotype

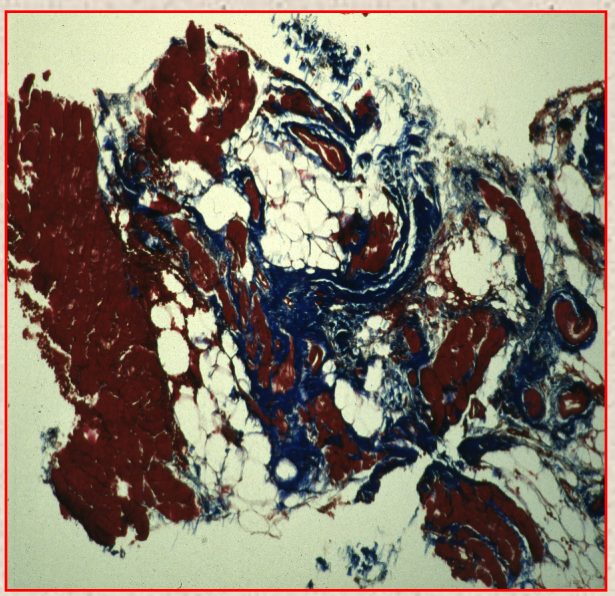




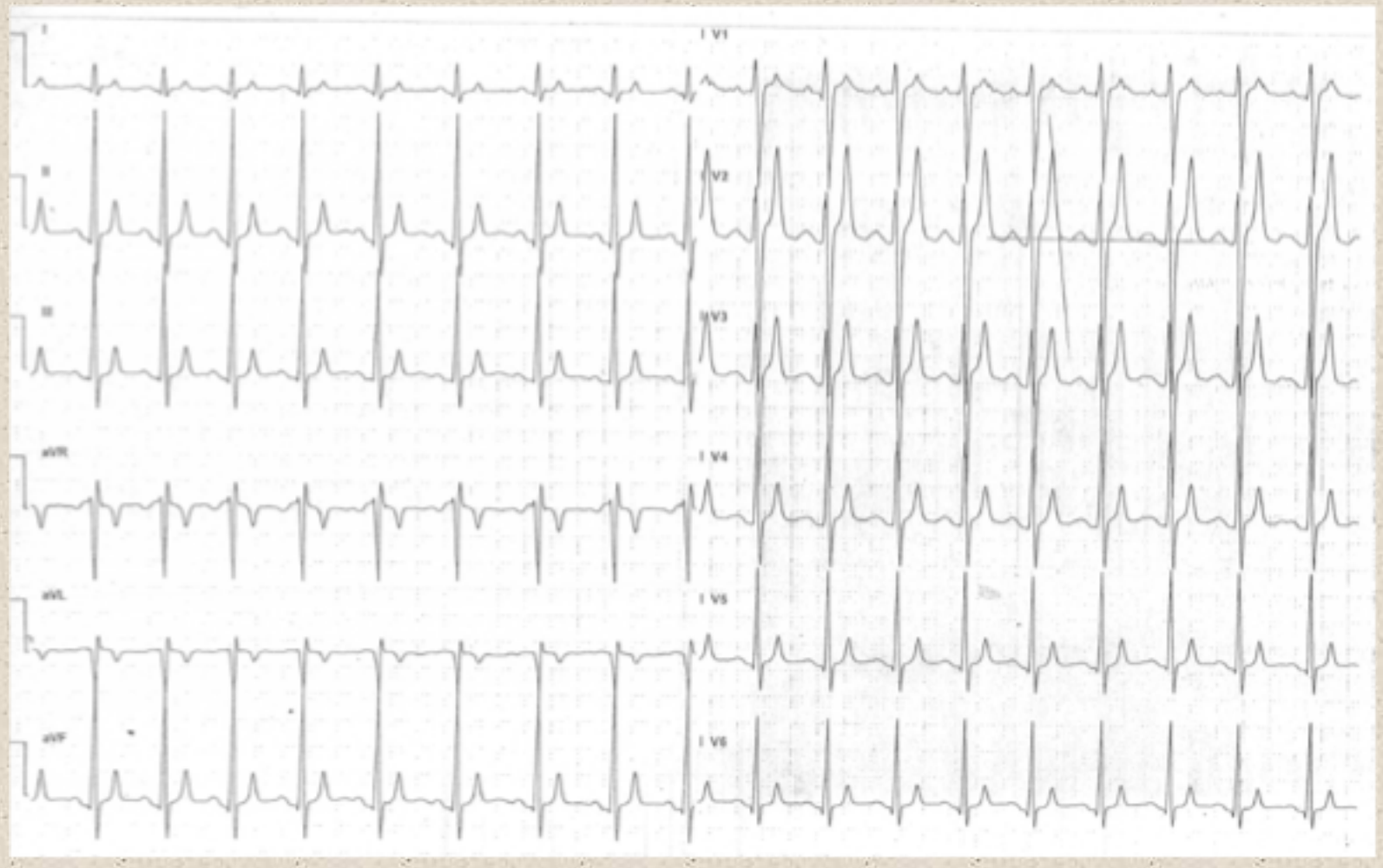








“Arrhythmogenic right ventricular cardiomyopathy/dysplasia”
Thiene G, Nava A, Rossi L, eds. Elsevier, Amsterdam, 1997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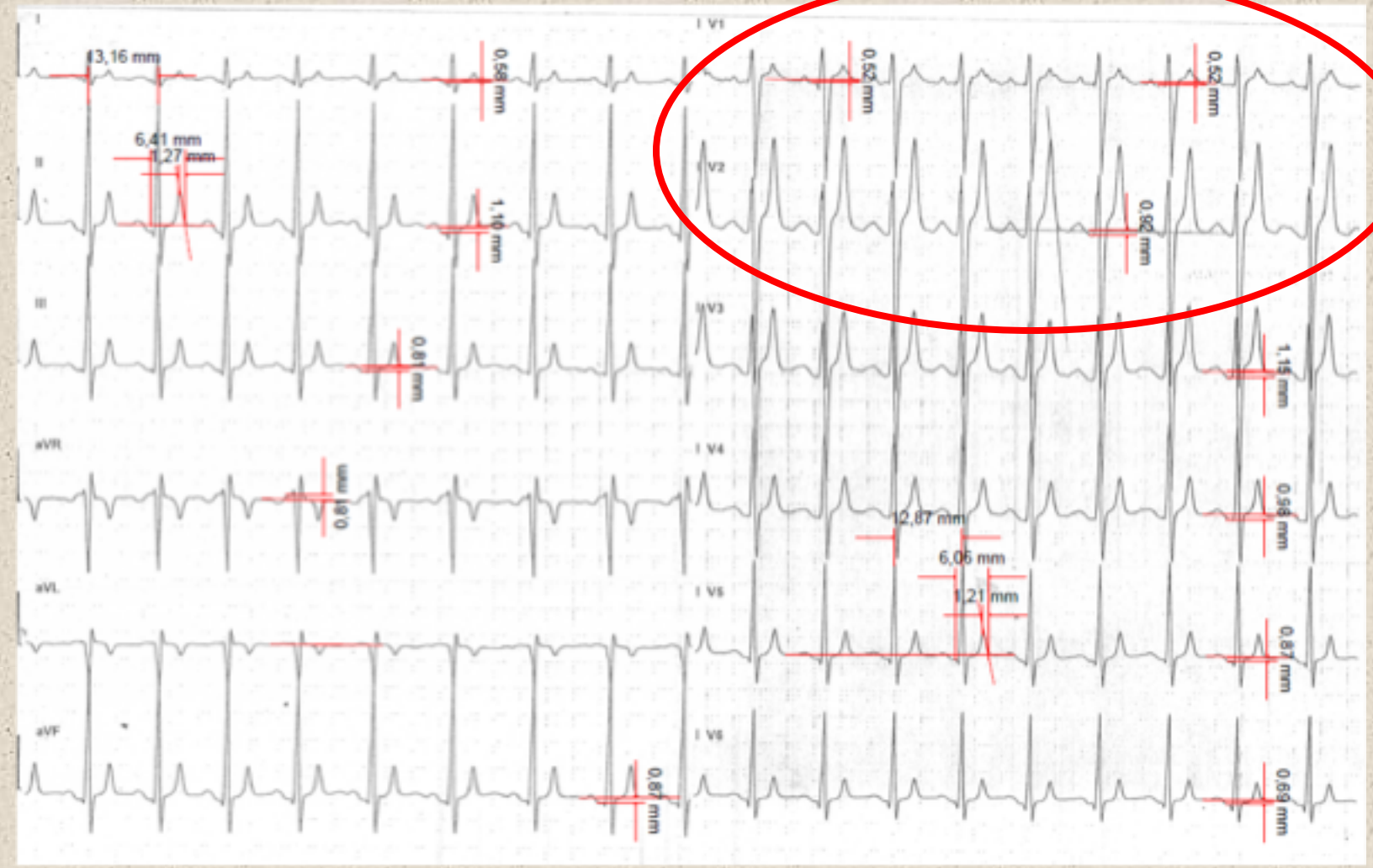
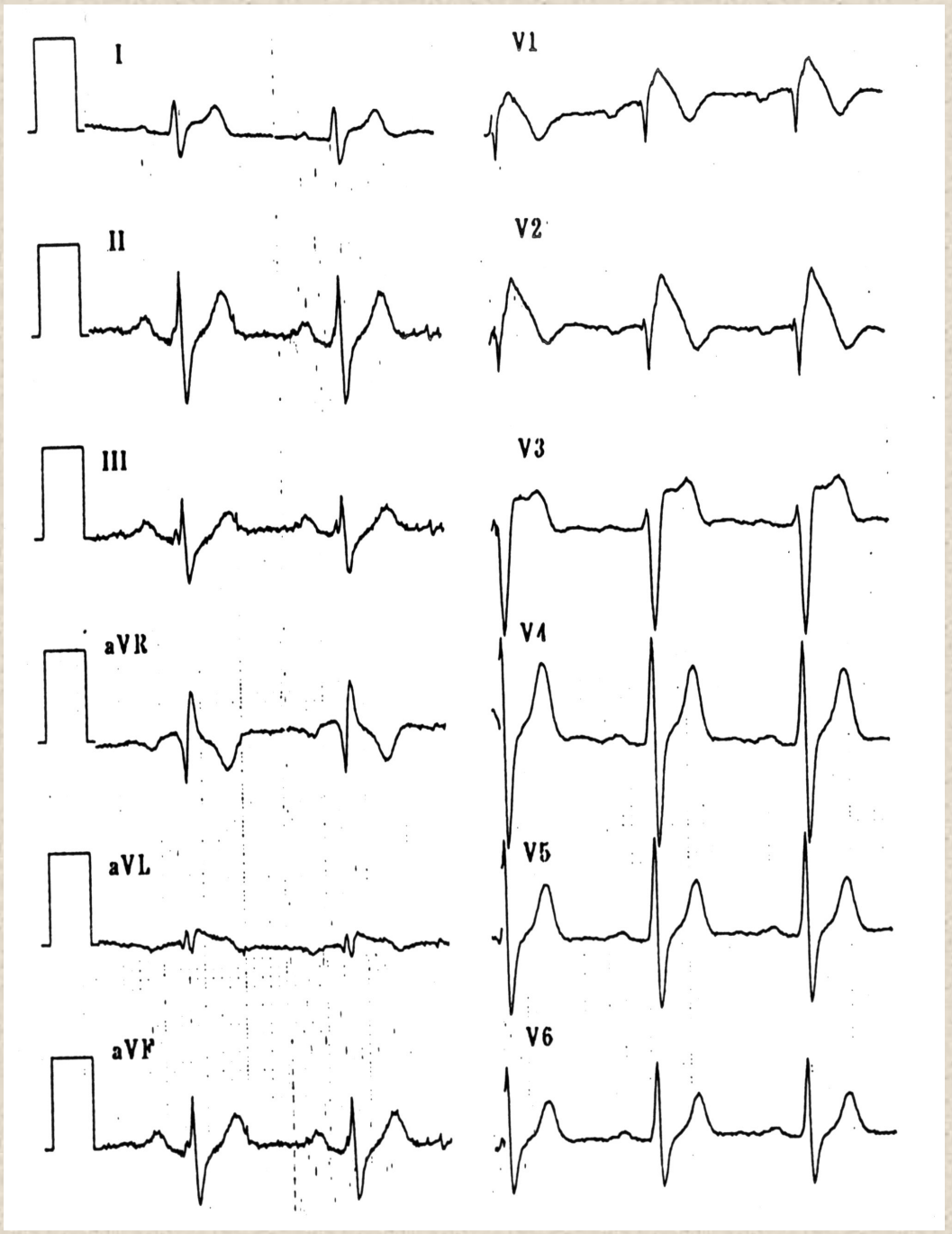
Short QT and PQ depression

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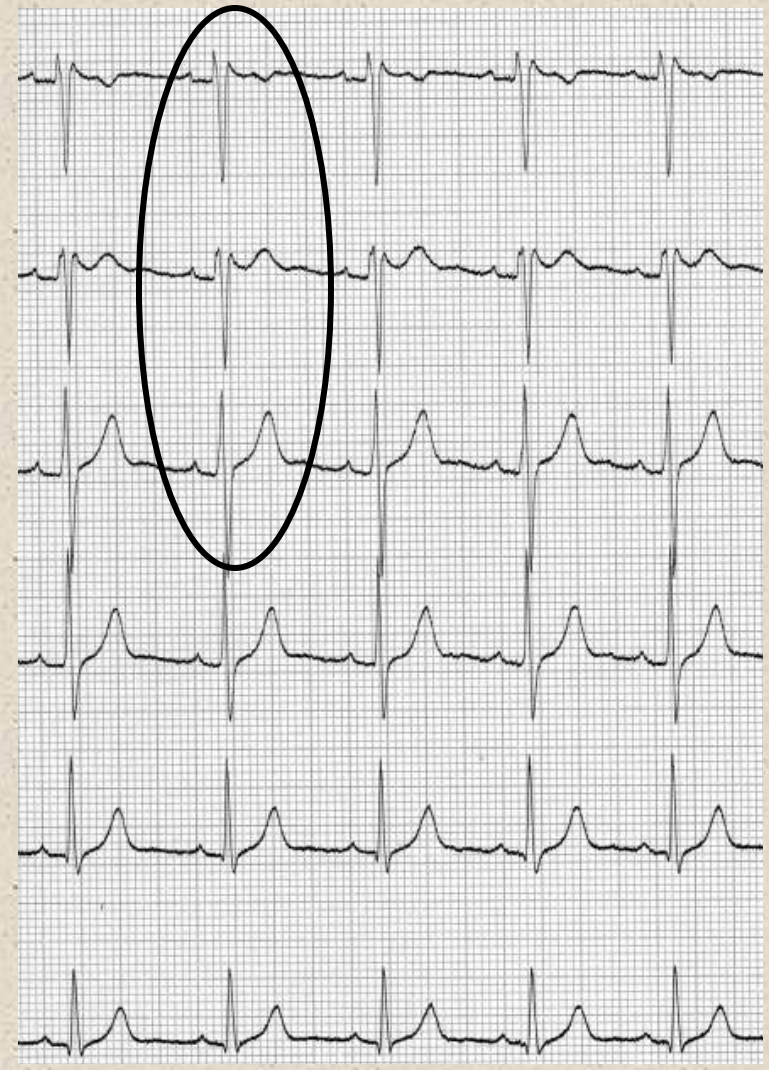
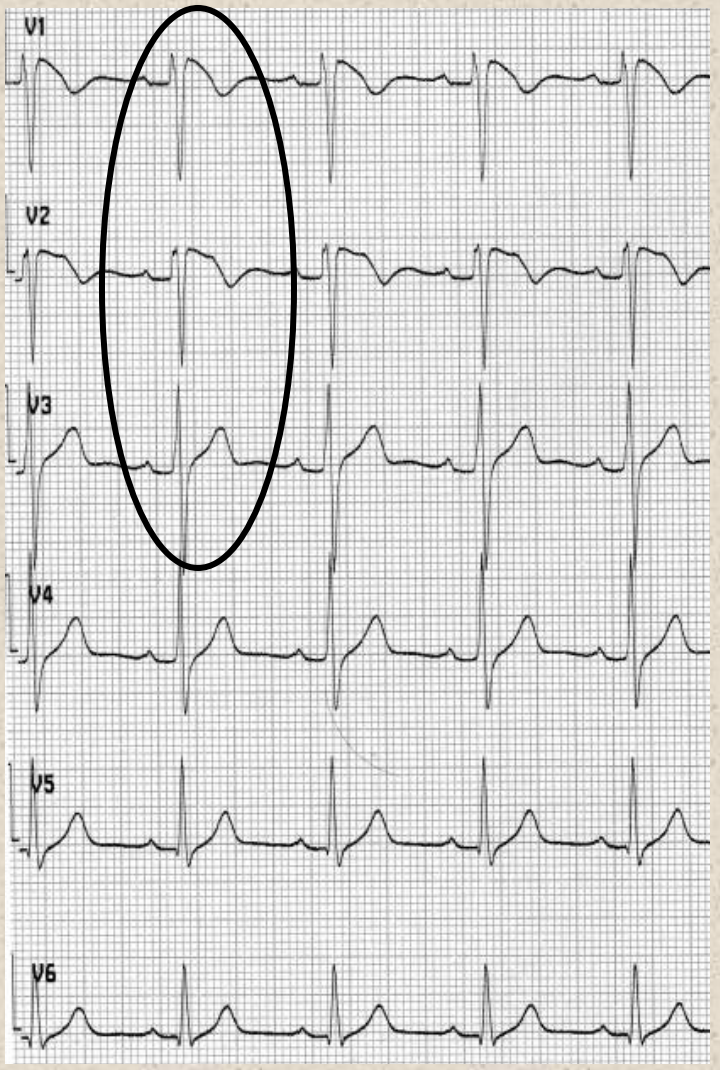
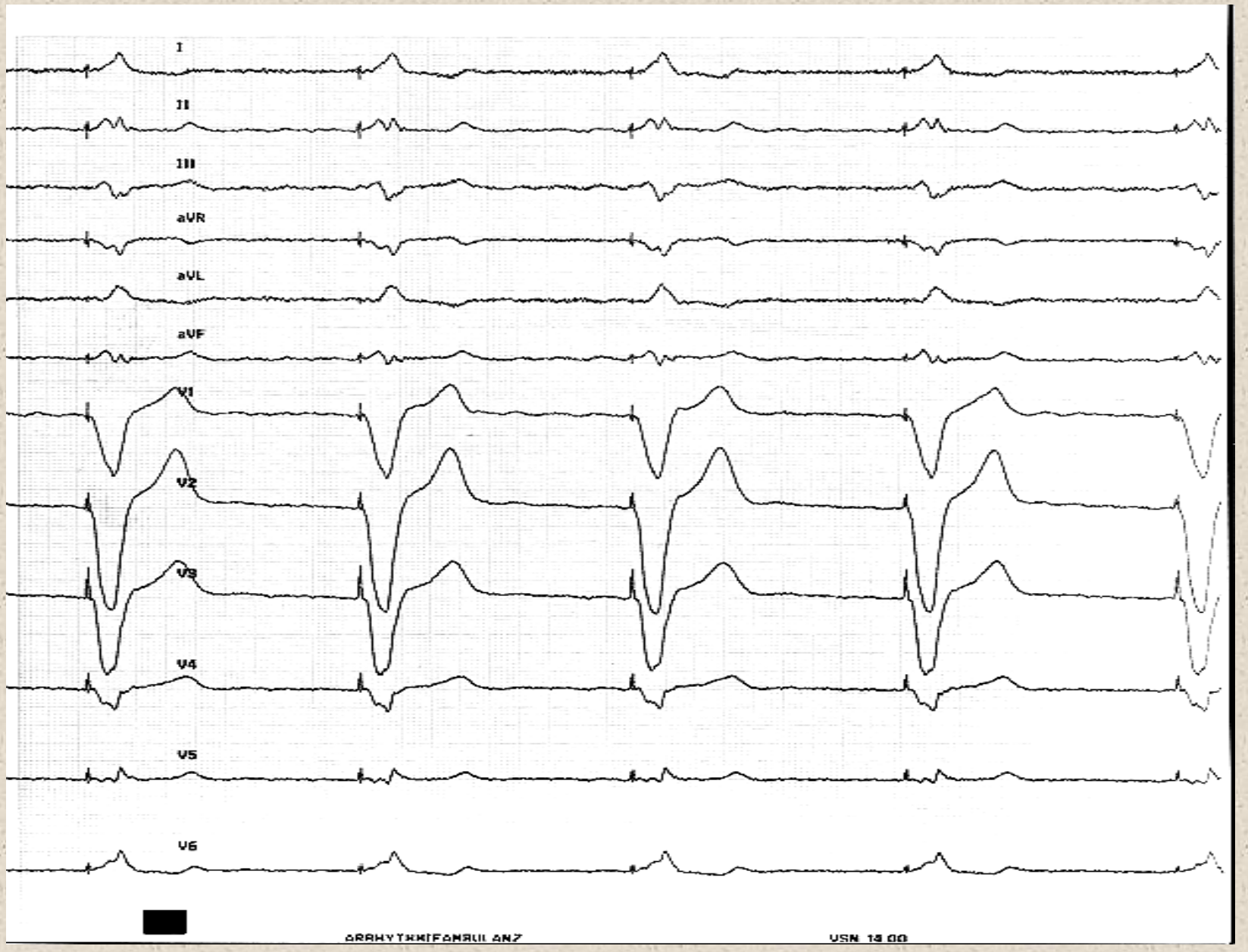


Resting ECG



Ajmalin 70 mg i.v.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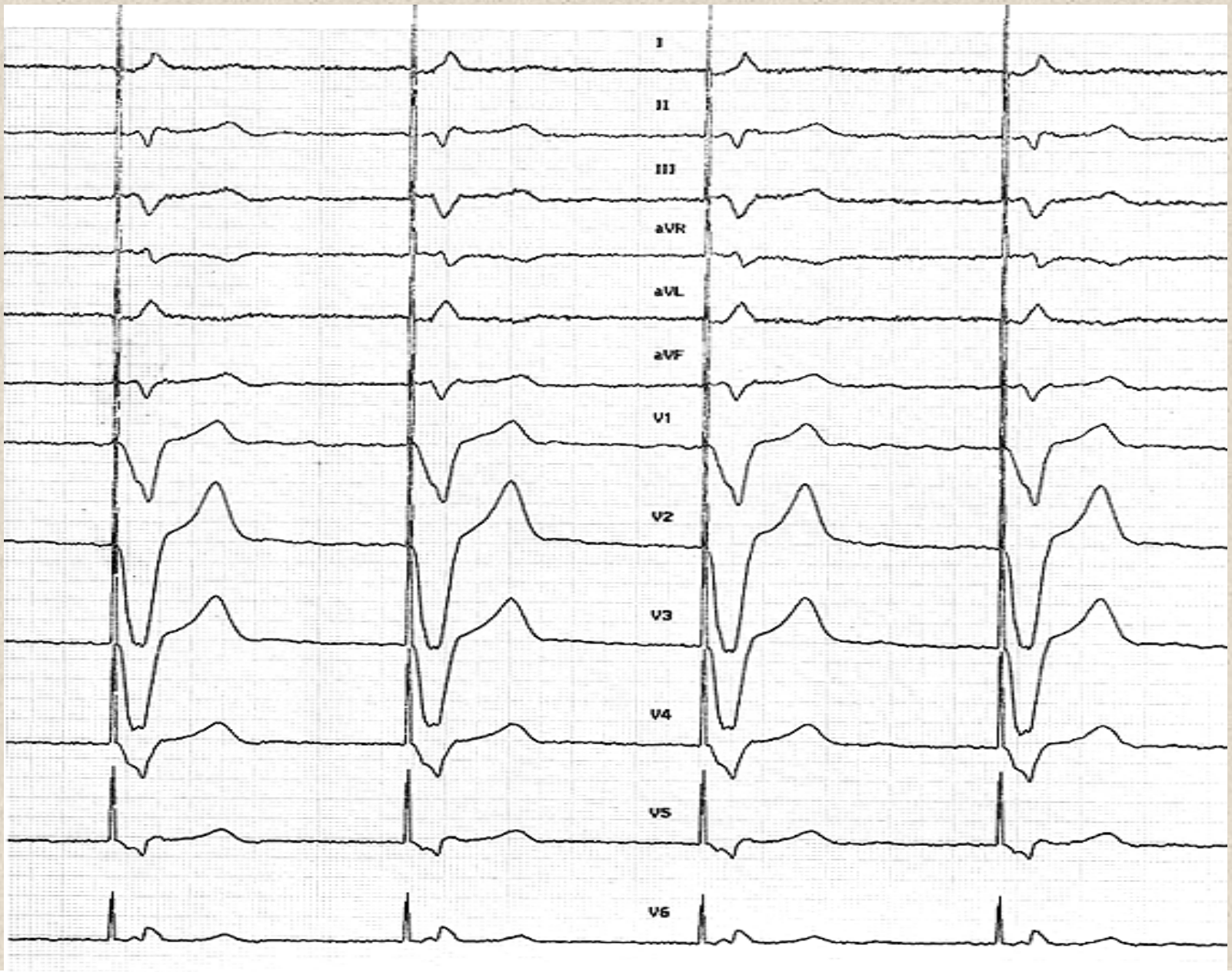
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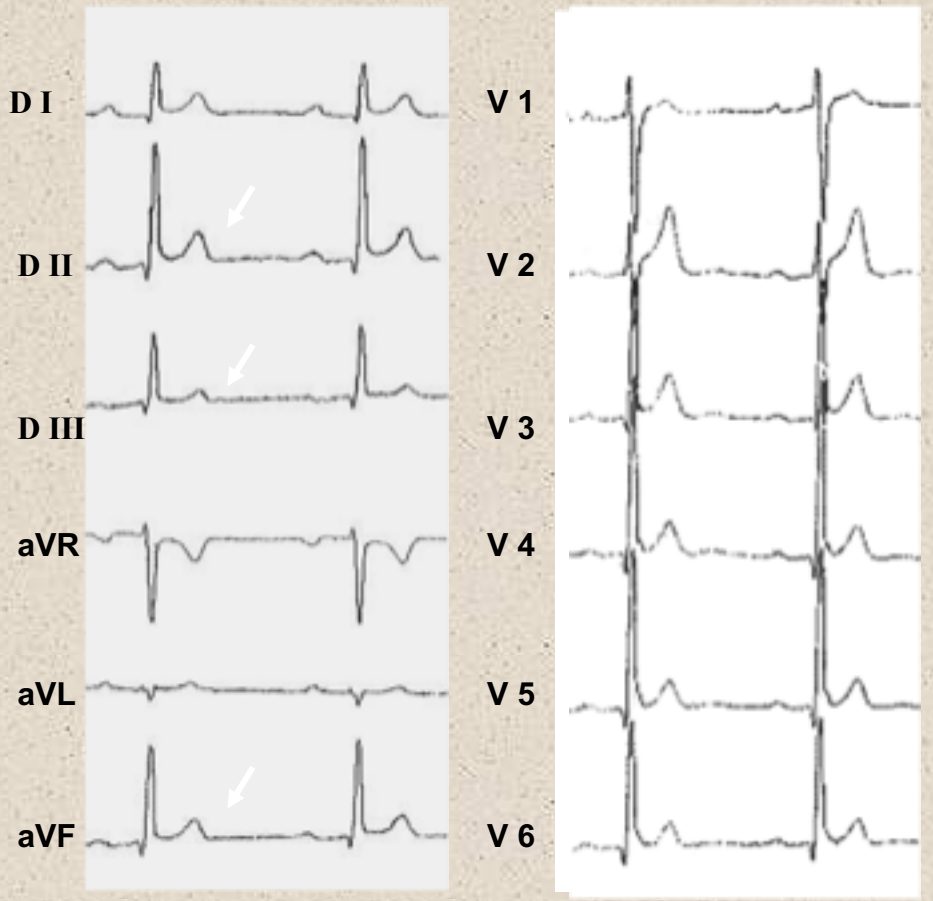
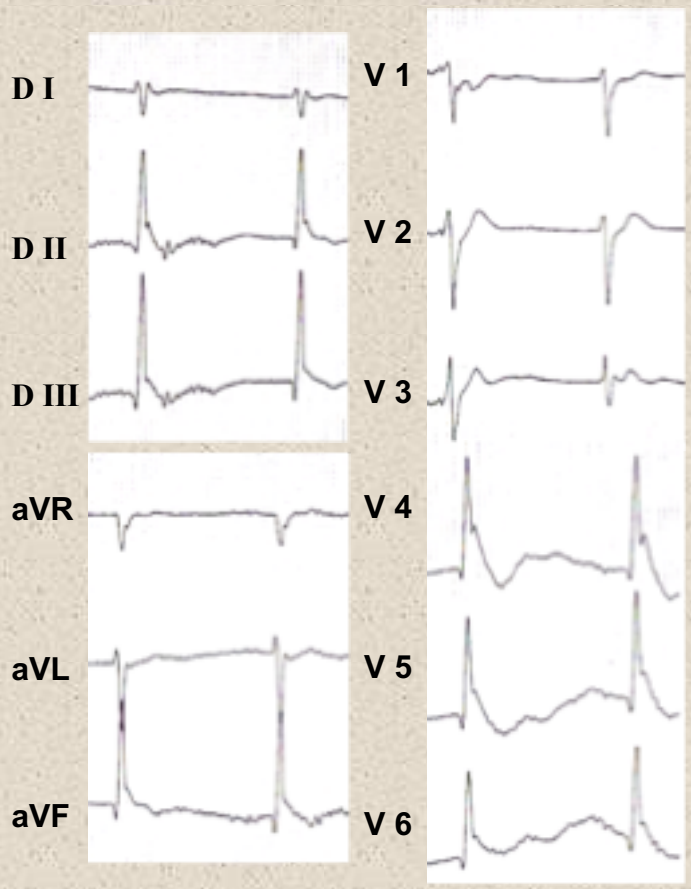
M 22yrs



April 2004



March 2006

Incidence of Early Repolarization in the inferolateral leads in IVF patients

Screening of all idiopathic VF from ICD databases

Early repolarization on Baseline ECGs defined as:

- Slurring (late delta) or notch at the end of QRS, with J point>0.1mV in ≥ 2 leads
- Left precordial and/or inferior and/or lateral ECG leads (excluding V1-V3 for Brugada/ARVD)

Haïssaguerre et al, N Engl J Med 2008;358:2016-23.

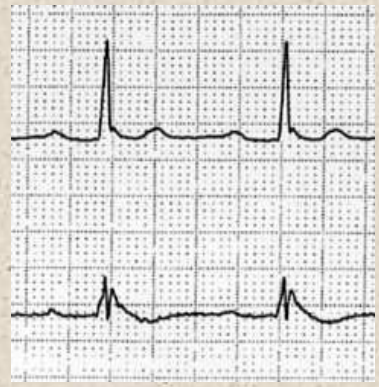
Ventricular Fibrillation with 'Early Repolarization'

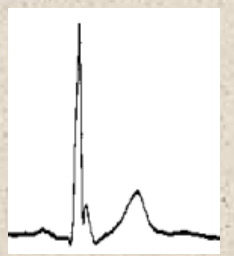
Incidence of early repolarization

31% ie 66 pts with IVF vs 4% in controls (p=0.002)

Amplitude of J point

2.15±1.2mm in IVF vs 1.05±0.2mm in controls





Haïssaguerre et al, N Engl J Med 2008;358:2016-23.

Sudden Cardiac Arrest Associated with Early Repolarization

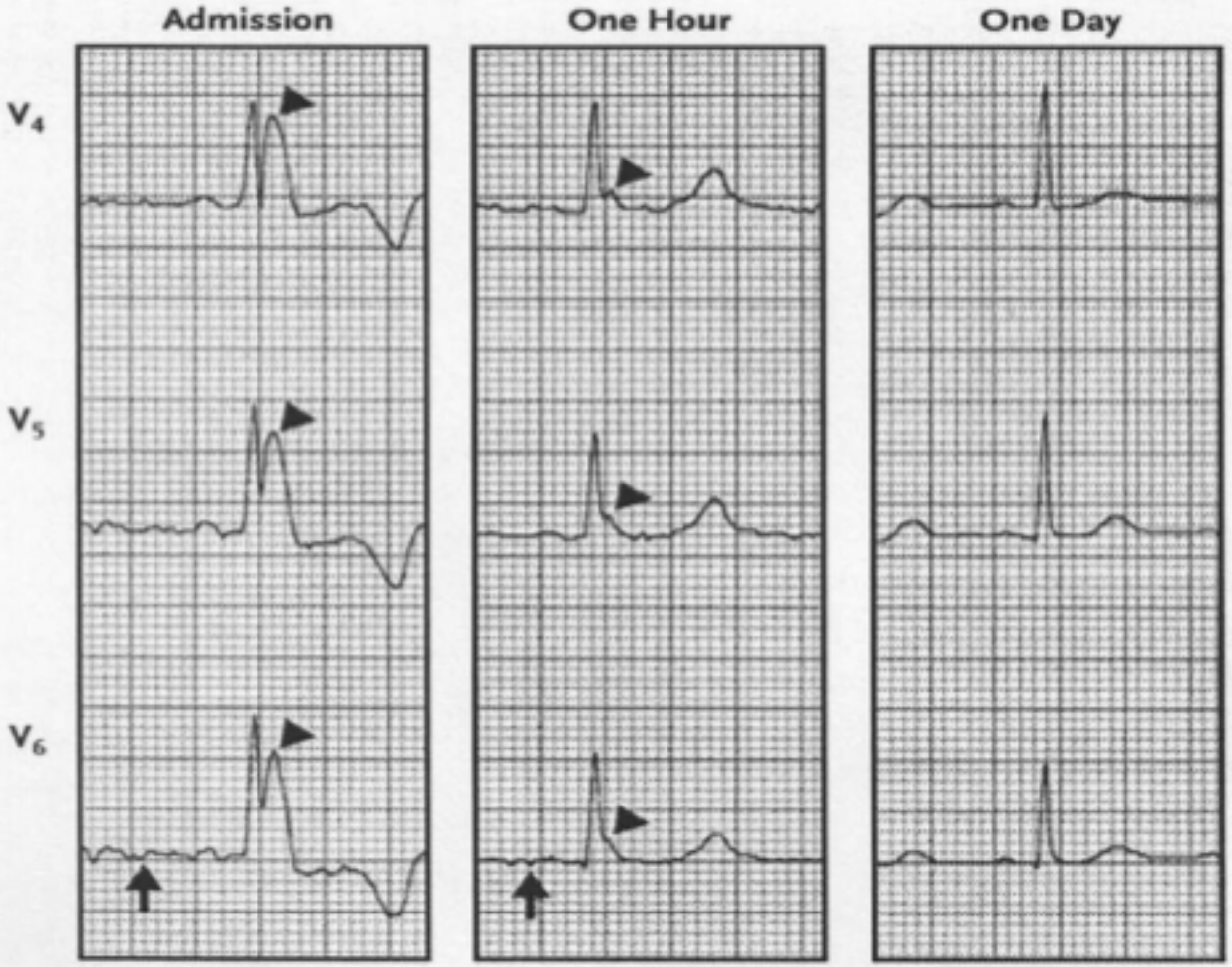
Michel Haïssaguerre, M.D., Nicolas Derval, M.D., Frederic Sacher, M.D., Laurence Jesel, M.D., Isabel Deisenhofer, M.D., Luc de Roy, M.D., Jean-Luc Pasquié, M.D., Ph.D., Akihiko Nogami, M.D., Dominique Babuty, M.D., Sinikka Yli-Mayry, M.D., Christian De Chillou, M.D., Patrice Scanu, M.D., Philippe Mabo, M.D., Seiichiro Matsuo, M.D., Vincent Probst, M.D., Ph.D., Solena Le Scouarnec, Ph.D., Pascal Defaye, M.D., Juerg Schlaepfer, M.D., Thomas Rostock, M.D., Dominique Lacroix, M.D., Dominique Lamaison, M.D., Thomas Lavergne, M.D., Yoshifusa Aizawa, M.D., Anders Englund, M.D., Frederic Anselme, M.D., Mark O'Neill, M.D., Meleze Hocini, M.D., Kang Teng Lim, M.B., B.S., Sebastien Knecht, M.D., George D. Veenhuyzen, M.D., Pierre Bordachar, M.D., Michel Chauvin, M.D., Pierre Jais, M.D., Gaelle Coureau, Ph.D., Genevieve Chene, Ph.D., George J. Klein, M.D., and Jacques Clémenty, M.D.

N Engl J Med 2008;358:2016-23

M 47years

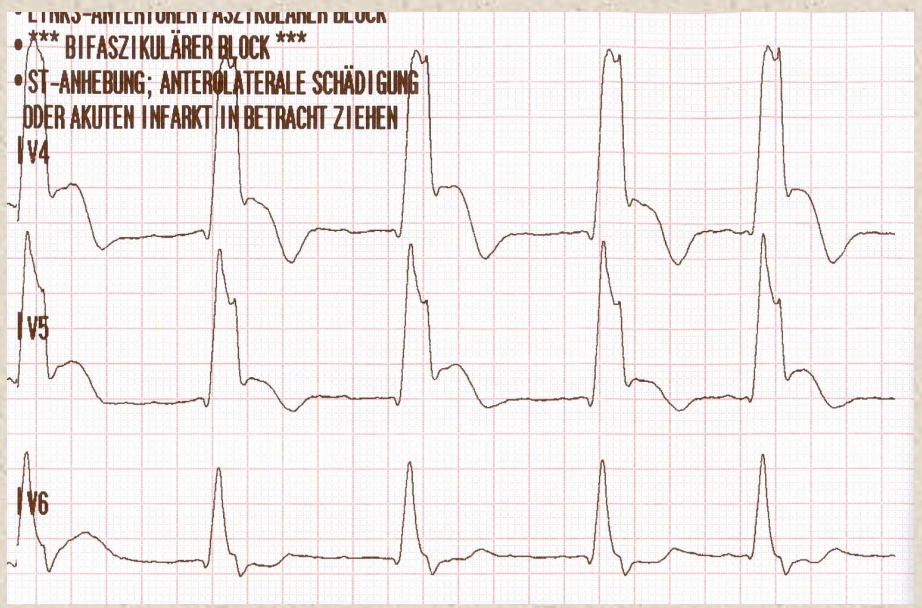
Krantz NEJM 2005;352:2

Giant Osborn Waves in Hypothermia

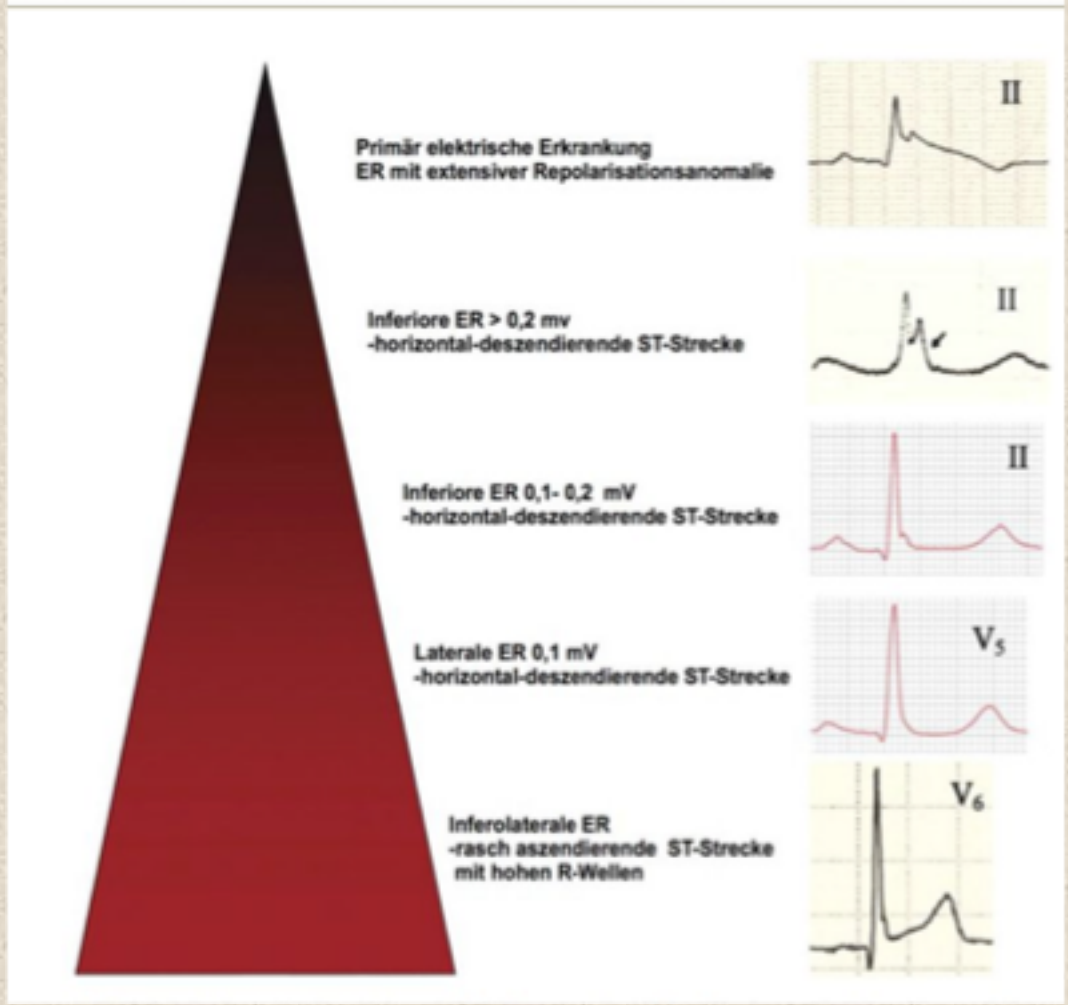


Temperature (C°)	24.1	29.4	36.6
Heart rate (beats/min)	50	70	98
QRS interval (msec)	184	119	71
QTc interval (msec)	516	502	403

Early Repolarization Syndrome in acute MI associated with primary VF



Early Repolarisationssyndrom



Juntilla et al. Eur Heart J 2012; 33, 2639–2644

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der Universität Heidelberg

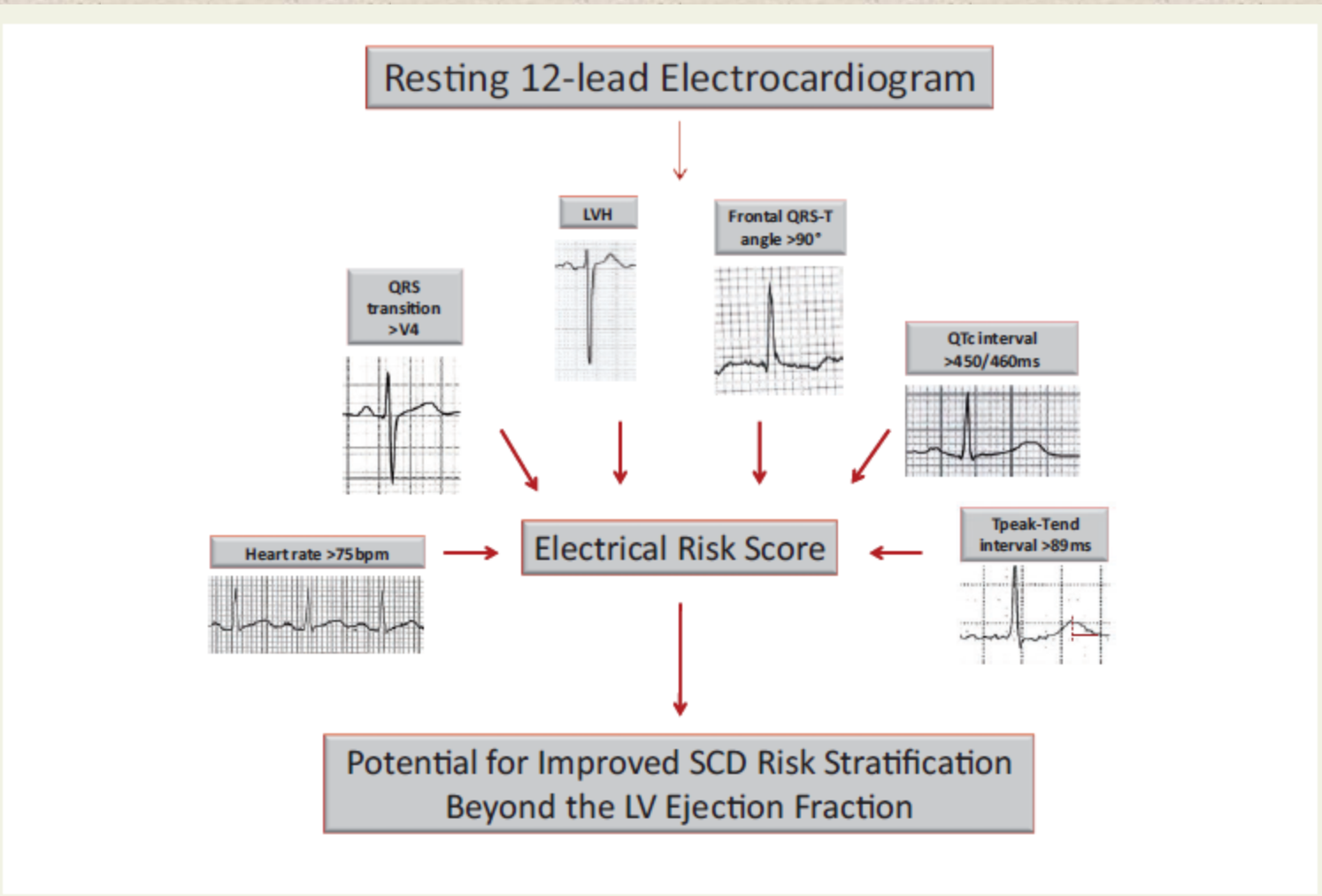
Universitätsklinikum Mannheim

Electrical risk score beyond the left ventricular ejection fraction: prediction of sudden cardiac death in the Oregon Sudden Unexpected Death Study and the Atherosclerosis Risk in Communities Study

Aapo L. Aro[1,2†], Kyndaron Reinier[1†], Carmen Rusinaru[1], Audrey Uy-Evanado[1], Navid Darouian[1], Derek Phan[1], Wendy J. Mack[3], Jonathan Jui[4], Elsayed Z. Soliman[5], Larisa G. Tereshchenko[4], and Sumeet S. Chugh[1*]

European Heart Journal 2017; 38: 3017-3025

ECG risk score and sudden cardiac arrest



Summarizing Figure Components of the multi-marker, cumulative electrocardiographic risk score for prediction of sudden cardiac death.

Aro et al. EHJ 2017 ; 38: 3017-3025

ECG risk score and sudden cardiac arrest

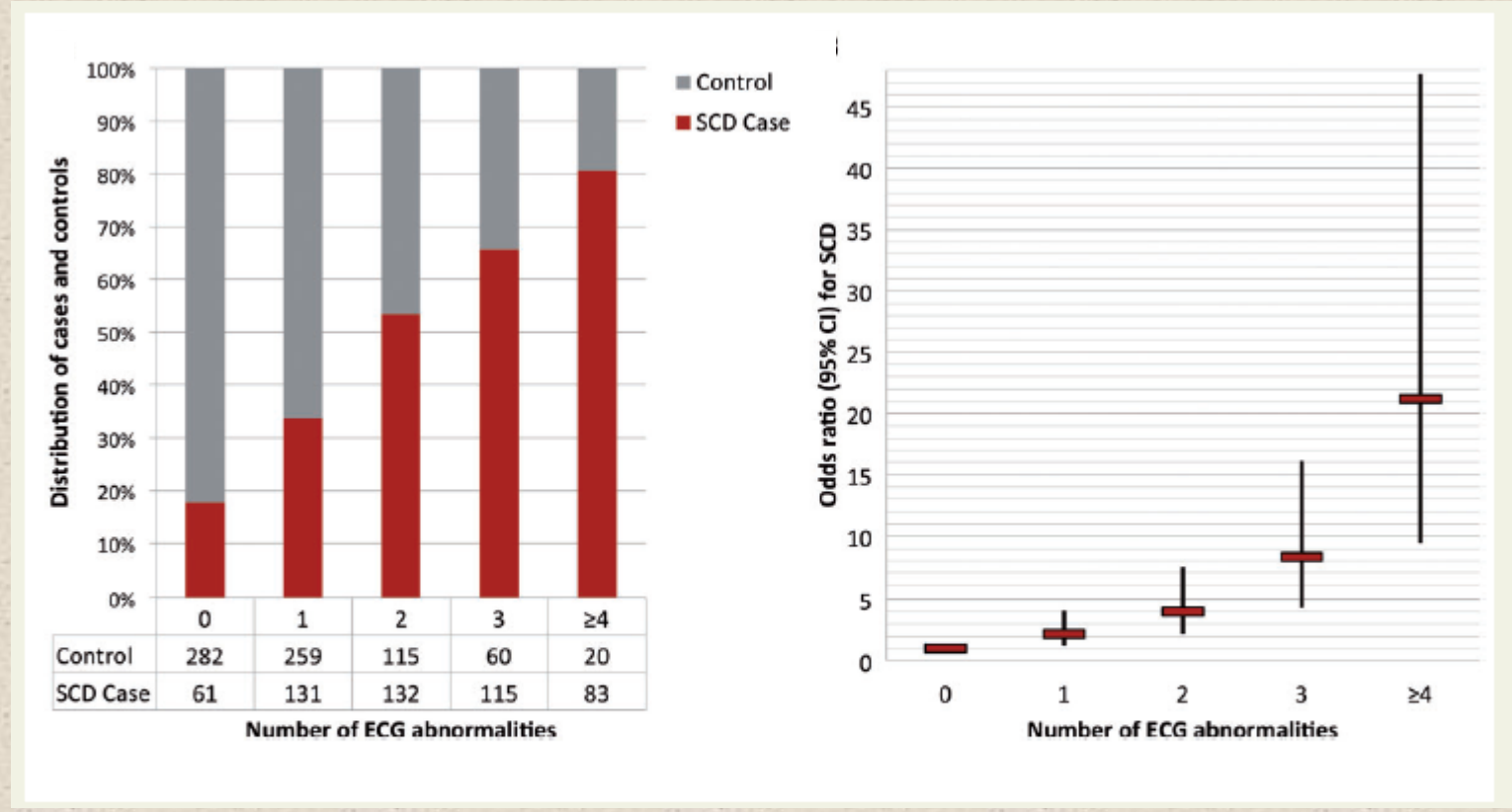
Electrocardiographic characteristics of SCD cases and controls, and unadjusted odds ratios for SCD associated with individual parameters

ECG pattern	Cases ($n = 522$)	Controls ($n = 736$)	Odds ratio (95% CI)	P-value
Heart rate >75 bpm	266 (51%)	167 (23%)	3.5 (2.8–4.5)	<0.001
QRSd >110 ms	72 (14%)	57 (8%)	1.9 (1.3–2.8)	<0.001
Prolonged QTc[a]	247 (47%)	114 (15%)	4.9 (3.8–6.4)	<0.001
Tpeak-Tend >89 ms	219 (42%)	188 (26%)	2.1 (1.7–2.8)	<0.001
QRS-T angle >90°	142 (27%)	103 (14%)	2.3 (1.7–3.1)	<0.001
Delayed QRS transition zone	147 (28%)	123 (17%)	2.0 (1.5–2.6)	<0.001
Electrocardiographic LVH	83 (16%)	59 (8%)	2.2 (1.5–3.1)	<0.001
Delayed intrinsicoid deflection	104 (20%)	107 (15%)	1.5 (1.1–2.0)	0.01

Aro et al. EHJ 2017 ; 38: 3017-3025

ECG risk score and sudden cardiac arrest

Prevalence of ECG abnormalities in the Oregon SUDS, and risk of SCD associated with the ECG risk score



ECG abnormalities between SCD cases and controls

Cumulative risk of SCD associated with the presence of multiple ECG abnormalities

Aro et al. EHJ 2017 ; 38: 3017-3025

ECG risk score and sudden cardiac arrest

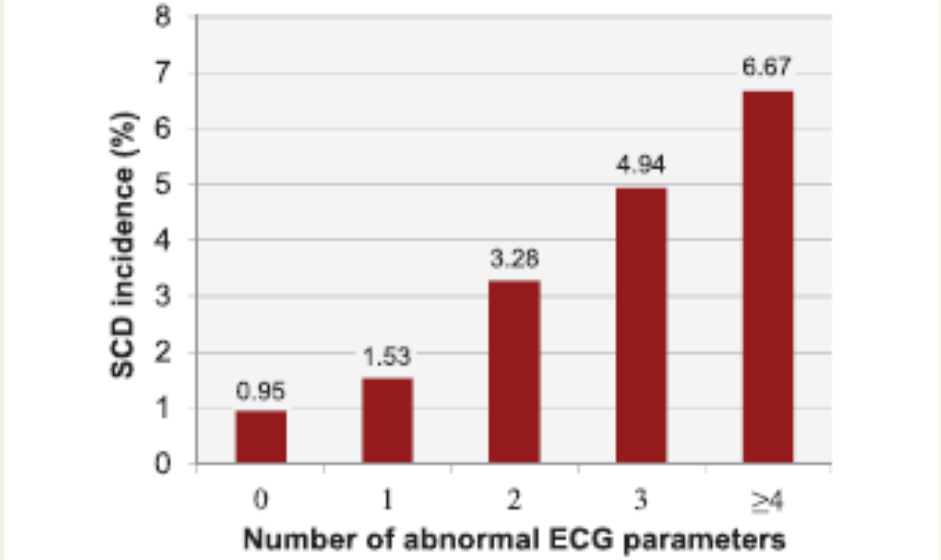


Figure 2 Incidence of sudden cardiac death (SCD) in the ARIC cohort. Observed cumulative incidence of SCD associated with the presence of multiple electrocardiogram (ECG) abnormalities in the ARIC validation cohort during the mean follow-up of 14 years.

Aro et al. EHJ 2017 ; 38: 3017-3025

Conclusions

- The ECG is an old tool that should be revisited.
- The ECG is neglected for risk stratification.
- Serial ECG‘s are important for risk assessment.
- The ECG is underused.