MALIGNANT ARRHYTHMIAS / SUDDEN CARDIAC DEATH

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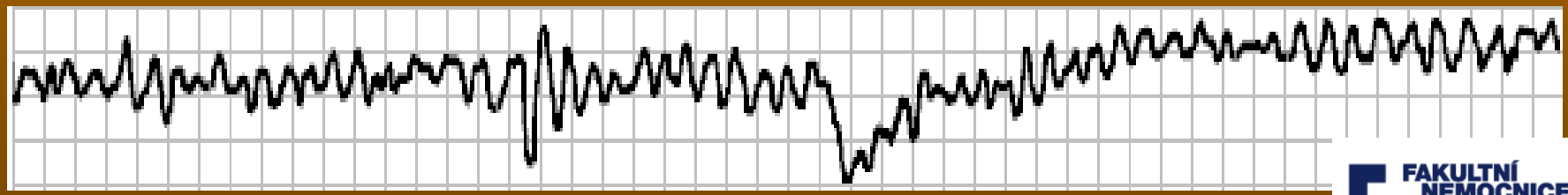
FAKULTNÍ NEMOCNICE BRNO

SCD

- **sudden unexpected death caused by loss of heart function (1 hour time window)**

- **sudden collapse**
- **no pulse**
- **no breathing**
- **loss of consciousness**



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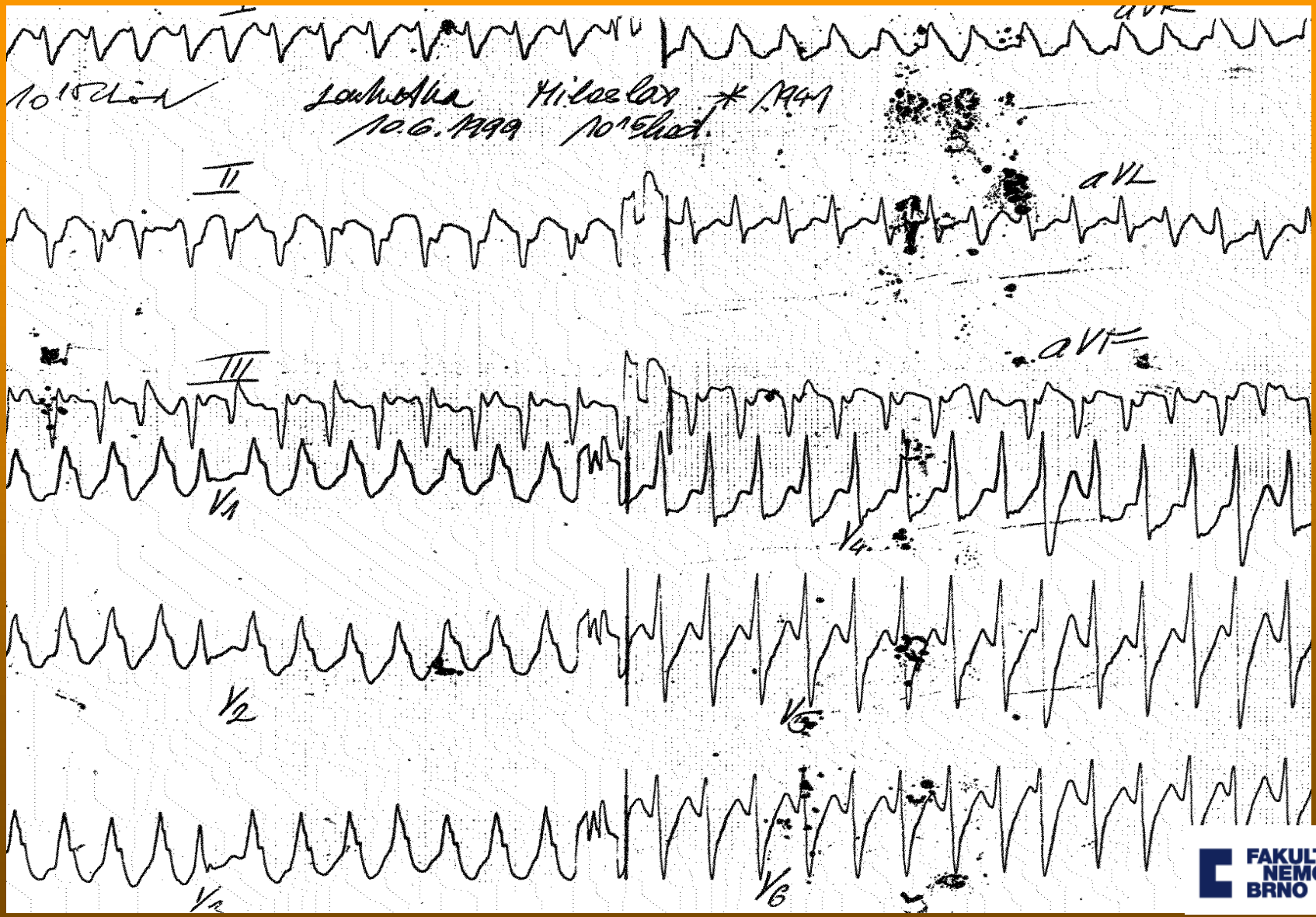
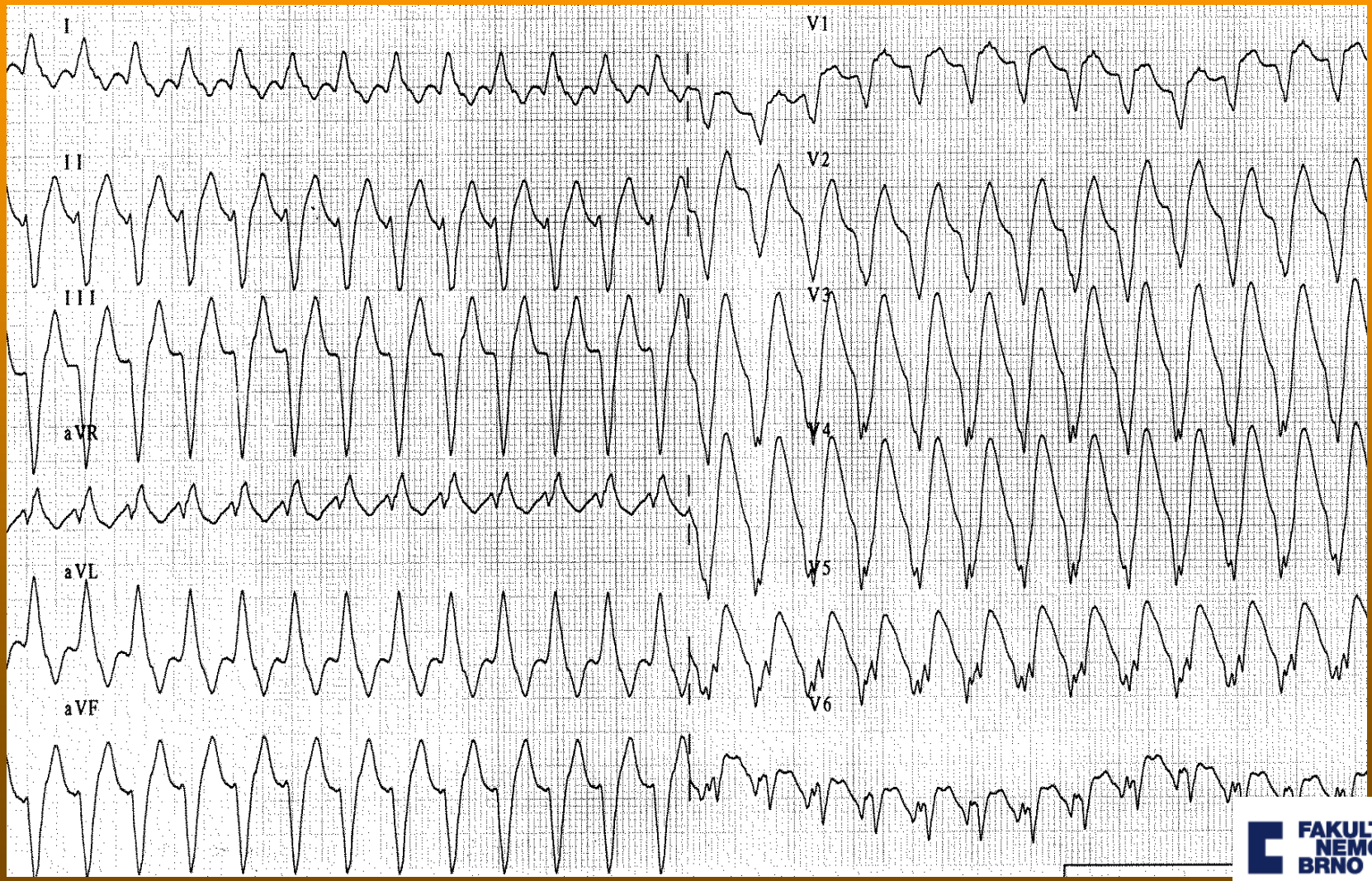
RBBB VT



LBBB VT



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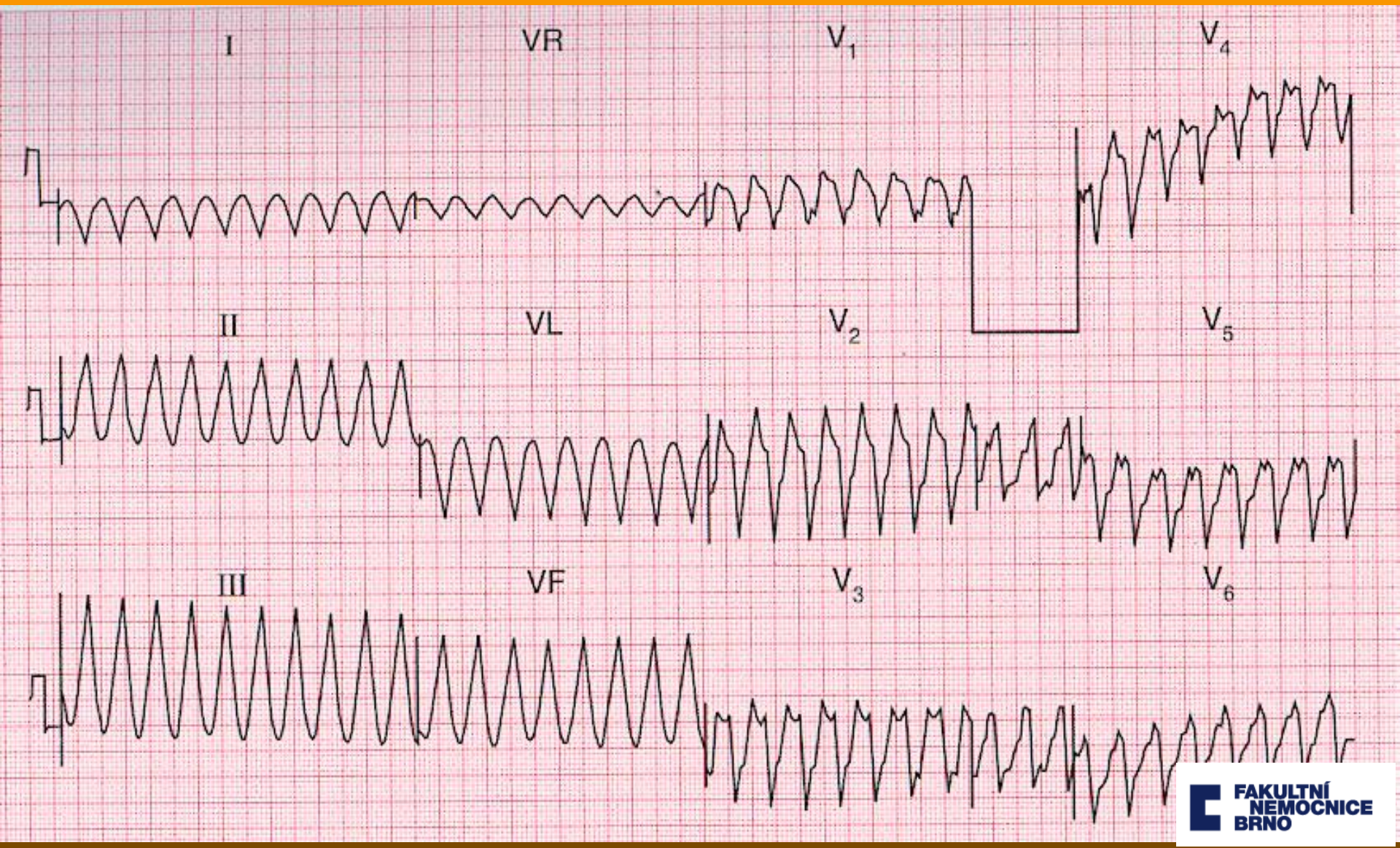
FVT



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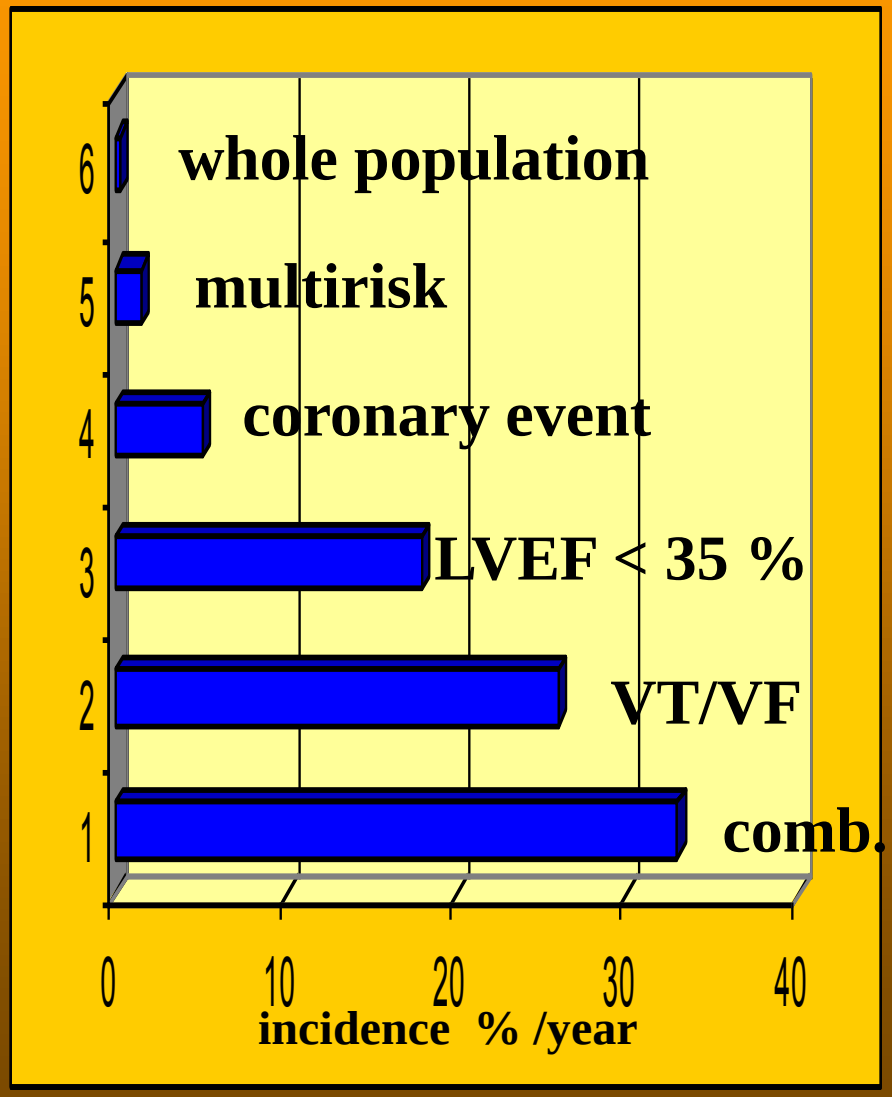
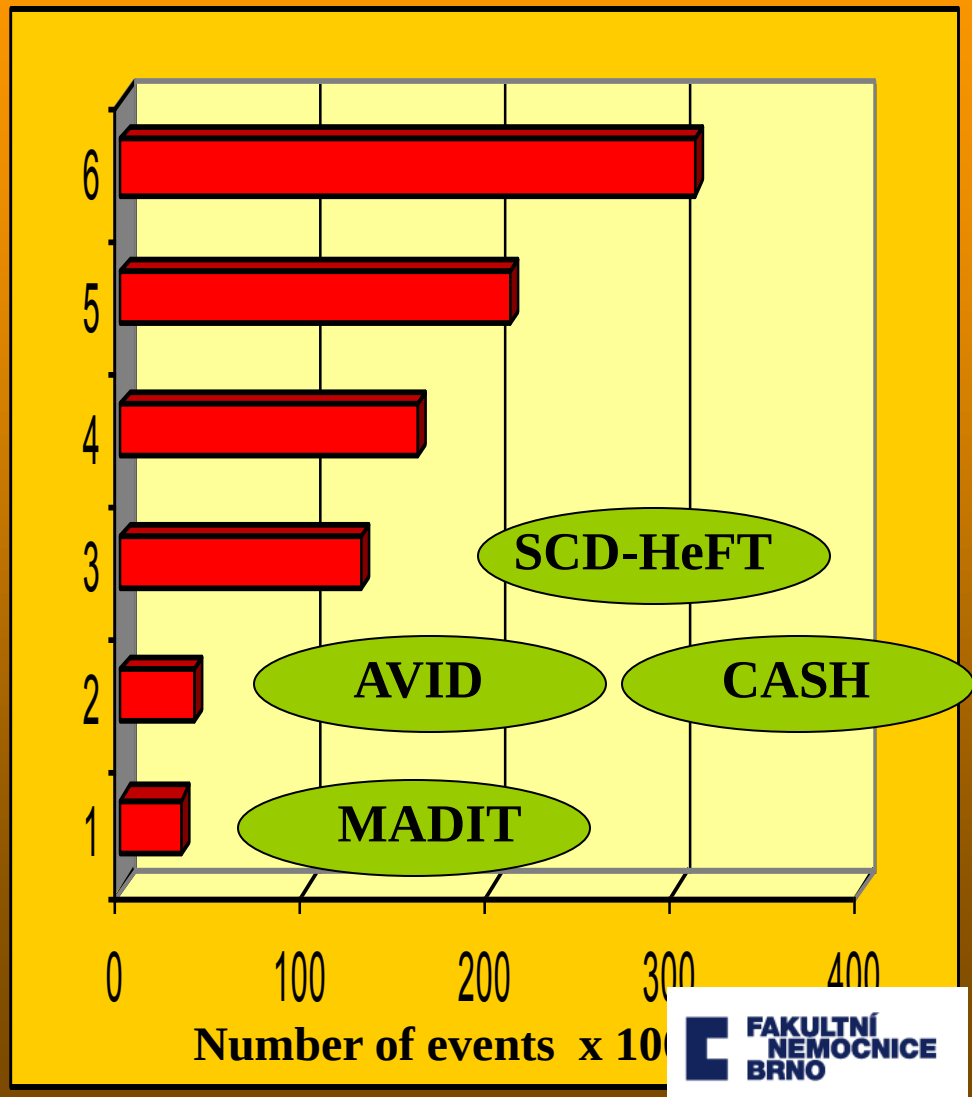
INCIDENCE / SCD TOTAL NUMBER





Myerburg et al., Circulation, 1998

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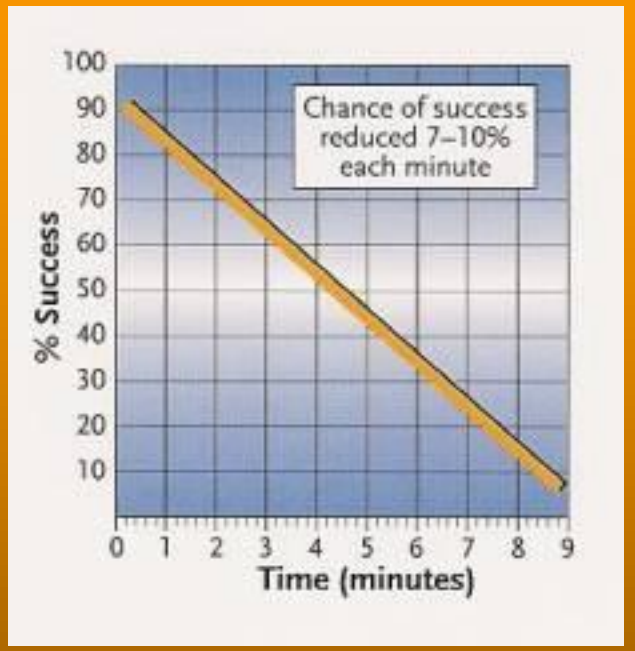
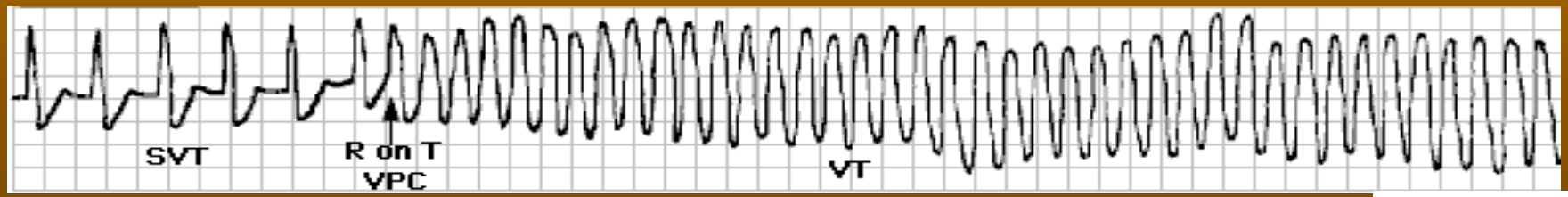
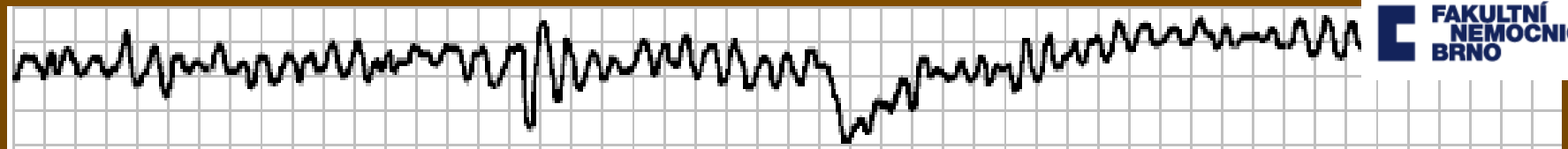
SCD - STATISTICS

SCD USA	**200-400.000/ year** Gillum R.F., Circul 1989
SCD EU	**2.500/day** Pisa Z., Sudden death 1980
Malignant arrhythmias	**80 - 90%** Gillum R.F., Pisa
Efficacy of CPR	**10-15%**







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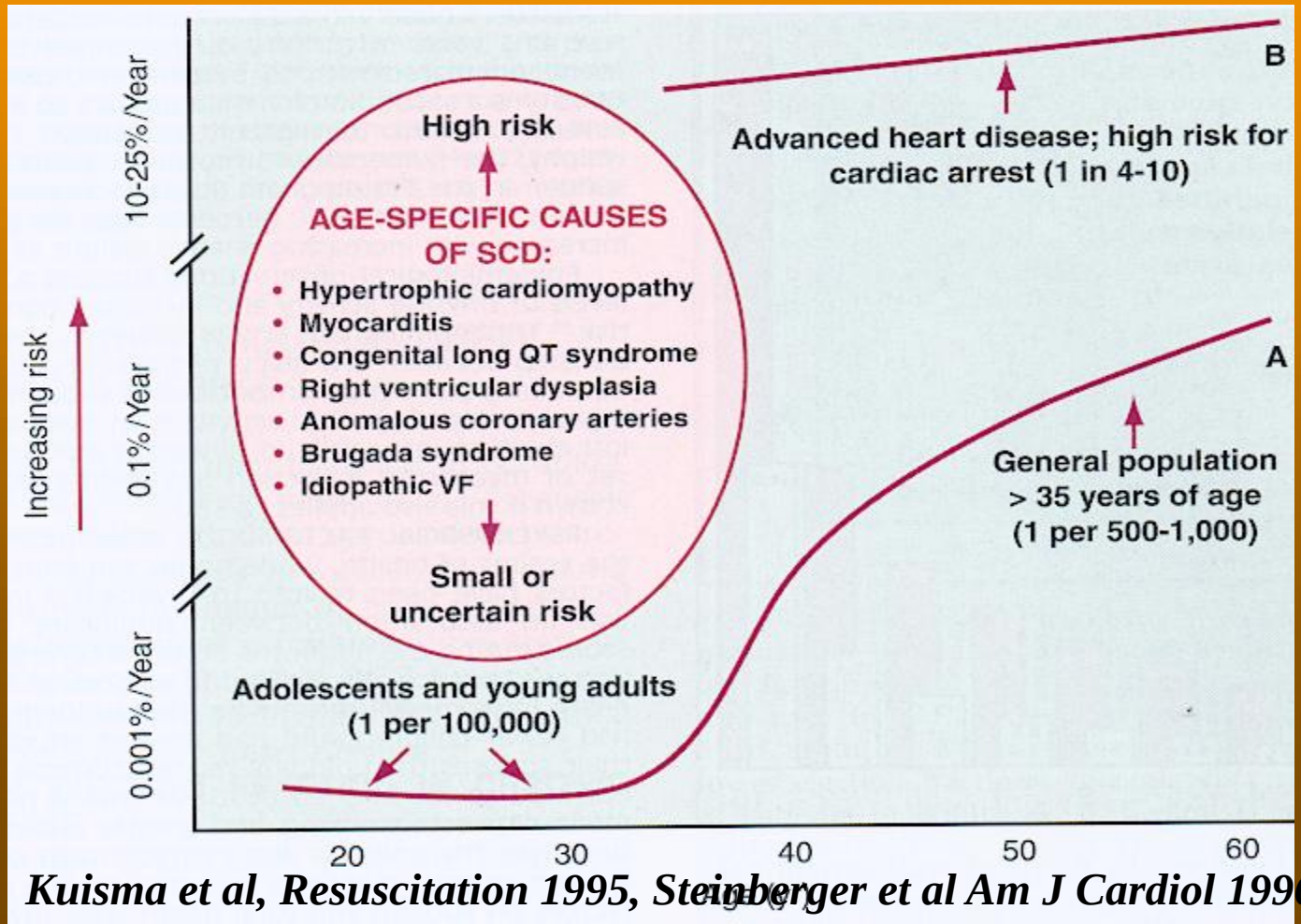
SCD x AGE

- incidence 1SCD/100.000 inhabitants < 35 (x 1/1000 u population > 35)
- acute forms CAD 20-39 - 76% SCD *Kuller et al. JAMA 1966,198:158*



Kuisma et al, Resuscitation 1995, Steinberger et al Am J Cardiol 1996

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PARIS PROSPECTIVE STUDY

- **7.079 man, age 43-52 years (1967-1972), follow-up 23 years**

•Jouven X et al. Circulation. 1999;99:1978-1983

TABLE 4. Adjusted RRs Associated With Sudden Death and Fatal Myocardial Infarction Before the Age of 65 Years in the Paris Prospective Study I by Multivariate Analysis

	Sudden Death at <65 y		Fatal Myocardial Infarction at <65 y	
Variables	RR (95% CI)	*P*	RR (95% CI)	*P*
Age at entry	0.96 (0.77–1.21)	NS	1.11 (0.87–1.41)	NS
Body mass index	1.29 (1.03–1.52)	0.04	0.87 (0.70–1.08)	NS
Tobacco consumption	1.39 (1.17–1.66)	0.0002	1.29 (1.09–1.55)	0.003
Diabetic status	2.64 (1.26–5.53)	0.01	0.96 (0.30–3.07)	NS
Heart rate	1.14 (0.98–1.38)	NS	1.21 (1.00–1.45)	0.04
Systolic arterial pressure	1.23 (1.01–1.51)	0.005	1.46 (1.22–1.75)	0.0001
Cholesterol	1.40 (1.13–1.65)	0.001	1.25 (1.00–1.52)	0.05
Triglycerides	0.98 (0.80–1.22)	0.93	1.06 (0.86–1.31)	NS
Parental myocardial infarction and death at <65 y	1.73 (0.42–7.14)	NS	3.42 (1.22–9.54)	0.0
Parental sudden death at <65 y	2.00 (1.02–3.90)	0.04	0.70 (0.26–1.81)	NS

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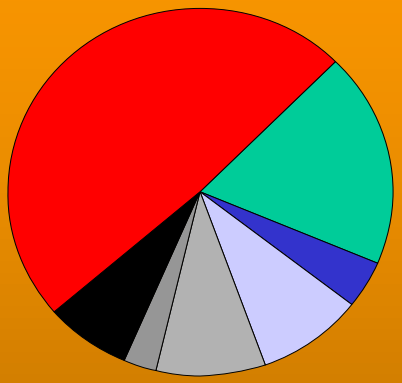
MUSTT

Schéma studie



ICHS, EFLK pod 40%, NSKT
2202 pacientů
PSK

PSK pozit.
704 p. (35%)
RANDOMIZACE

PSK neg.
1435 p.(65%)

no AA
353

EP guided terapie
351

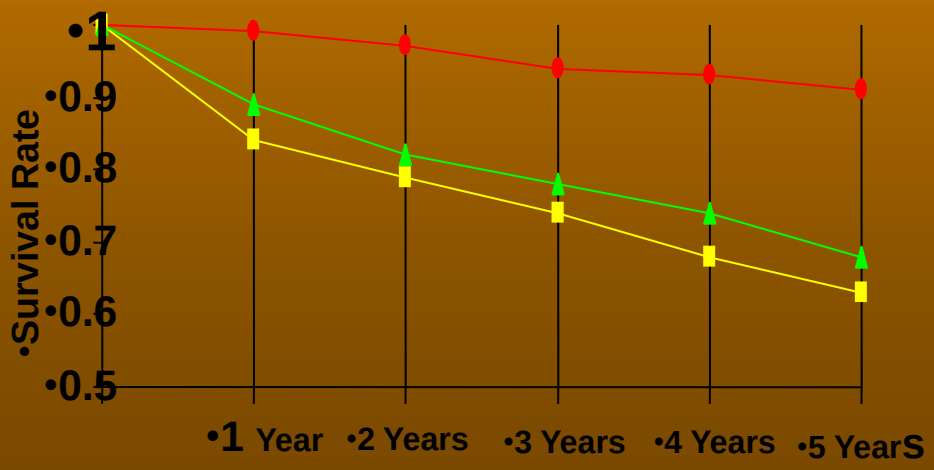
účinná AA
190

neúčinná AA
161

ICD

redukce TM
-50%

redukce TM
-27%



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MORTALITY – HISTORY x TODAY

Original Articles

Changing Characteristics and Mode of Death Associated With Chronic Heart Failure Caused by Left Ventricular Systolic Dysfunction

A Study Across Therapeutic Eras

Table 2. Use of Heart Failure Therapies

	Historic (n=281)	Contemporary (n=357)	P
Drug			
Angiotensin-converting enzyme inhibitor, % (n)	83 (233)	89 (317)	0.02
Mean dose, ramipril equivalent, mg	3.4 (0.2)	5.1 (0.2)	<0.001
β-Adrenoceptor blocker, % (n)	8.5 (24)	80 (284)	<0.001
Aldosterone antagonists, % (n)	0	36 (129)	<0.001
Statin, % (n)	3.2 (9)	58 (204)	<0.001
Amiodarone, % (n)	16 (46)	13 (45)	0.18
Digoxin, % (n)	21 (60)	13 (46)	0.004
Loop diuretic, % (n)	98 (274)	72 (254)	<0.001
Mean dose, furosemide equivalent, mg	79 (3.9)	47 (2.7)	<0.001
Device-based therapies			
ICD, % (n)	0	16 (57)	<0.001
CRT, % (n)	0	23 (82)	<0.001

Table 1. Patient Characteristics Within Historic and Contemporary Cohorts

	Historic Cohort (n=281)	Contemporary Cohort (n=357)	P
Age, y	62 (0.6)	66 (0.7)	<0.001
Male sex, % (n)	81 (227)	71 (254)	0.005
Ischemic etiology, % (n)	79 (221)	62 (222)	<0.001
NYHA class, % (n)			<0.001
I	1 (3)	25 (91)	
II	51 (144)	43 (153)	
III	46 (129)	29 (103)	
IV	2 (5)	3 (9)	
Nonfasting glucose, mmol/L	5.0 (4.6–5.8)	5.2 (4.8–5.8)	0.29
Sodium, mmol/L	140 (0.2)	140 (0.2)	0.39
Potassium, mmol/L	4.3 (0.03)	4.4 (0.02)	0.004
eGFR, mL/kg per minute	58 (1.1)	56 (0.9)	0.08
Cardiothoracic ratio	0.54 (0.004)	0.55 (0.003)	0.13
LV end-diastolic dimension, mm	65 (0.6)	60 (0.5)	<0.001
LV end-systolic dimension, mm	56 (0.6)	49 (0.6)	<0.001
LV ejection fraction, %	30 (0.5)	31 (0.5)	0.44
QRS maximum, ms	138 (1.9)	134 (1.8)	0.09
QRS maximum >120 ms, % (n)	70 (168)	58 (176)	0.003
QTc maximum, ms	502 (3.1)	471 (2.3)	<0.001
QTc dispersion, ms	82 (61–104)	30 (19–43)	<0.001
LV hypertrophy on ECG, % (n)	9 (22)	20 (60)	0.001

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- SCD 33,6% x 12,7%

MORTALITY – HISTORY x TODAY

- SCD 33,6% x 12,7%

Original Articles

Changing Characteristics and Mode of Death Associated With Chronic Heart Failure Caused by Left Ventricular Systolic Dysfunction

A Study Across Therapeutic Eras

Richard M. Cubbon, MRCP, PhD; Christopher P. Gale, MRCP, PhD; Lorraine C. Kearney, BSc; Clyde B. Schechter, FACPM, MD; W. Paul Brooksby, FRCP, MD; Jim Nolan, FRCP, MD; Keith A.A. Fox, FRCP, MD; Adil Rajwani, MRCP, PhD; Wazir Baig, FRCP, MD; David Groves, PhD; Pauline Barlow, BSc; Anthony C. Fisher, MD; Phillip D. Batin, FRCP, MD; Matthew B. Kahn, MRCP; Azfar G. Zaman, FRCP, MD; Ajay M. Shah, FRCP, MD; Jon A. Byrne, MRCP, MD; Steven J. Lindsay, FRCP, MD; Robert J. Sapsford, FRCP, MD; Stephen B. Wheatcroft, MRCP, PhD; Klaus K. Witte, MRCP, MD; Mark T. Kearney, FRCP, MD

Background—Therapies for patients with chronic heart failure caused by left ventricular systolic dysfunction have advanced substantially over recent decades. The cumulative effect of these therapies on mortality, mode of death, symptoms, and clinical characteristics has yet to be defined.

Methods and Results—This study was a comparison of 2 prospective cohort studies of outpatients with chronic heart failure caused by left ventricular systolic dysfunction performed between 1993 and 1995 (historic cohort: n=281) and 2006 and 2009 (contemporary cohort: n=357). In the historic cohort, 83% were prescribed angiotensin-converting enzyme inhibitors and 8.5% were prescribed β-adrenoceptor antagonists, compared with 89% and 80%, respectively, in the contemporary cohort. Mortality rates over the first year of follow-up declined from 12.5% to 7.8% between eras (P=0.04), and sudden death contributed less to contemporary mortality (33.6% versus 12.7%; P<0.001). New York Heart Association class declined between eras (P<0.001). QTc dispersion across the chest leads declined from 85 ms (SD, 2) to 34 ms (SD, 1) and left ventricular end-diastolic dimensions declined from 65 mm (SD, 0.6) to 59 mm (SD, 0.5) (both P<0.001).

(*Circ Heart Fail*. 2011;4:

FAKULTNÍ NEMOCNICE BRNO

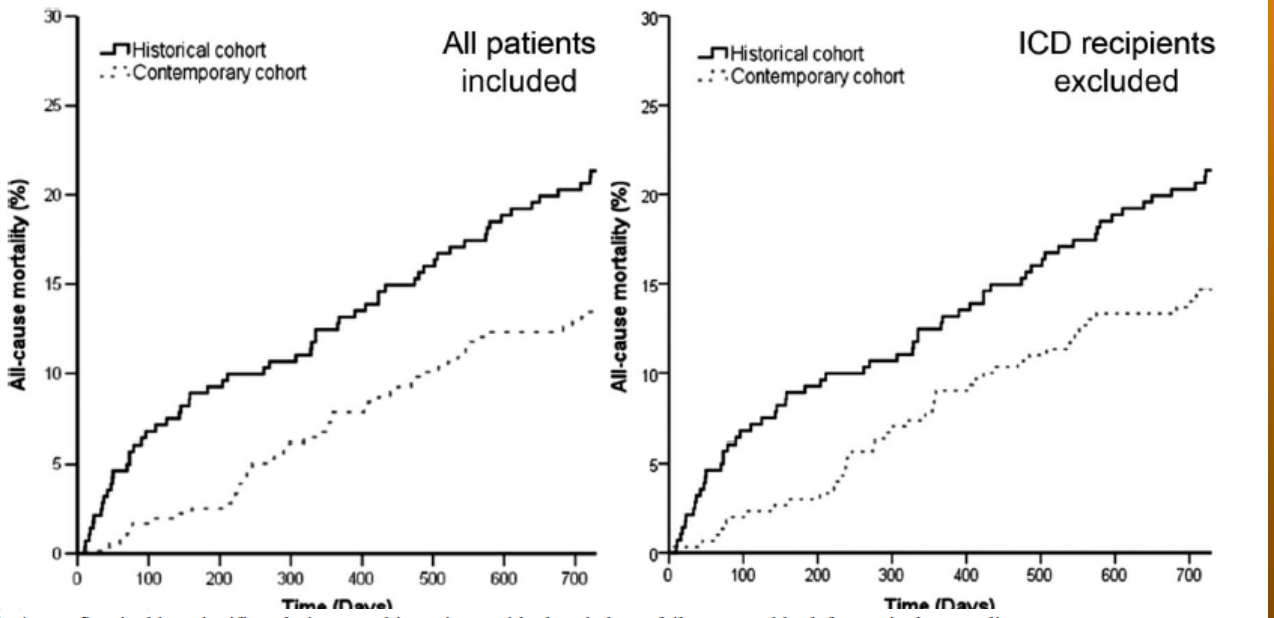
Changing Characteristics and Mode of Death Associated With Chronic Heart Failure Caused by Left Ventricular Systolic Dysfunction

A Study Across Therapeutic Eras

Richard M. Cubbon, MRCP, PhD; Christopher P. Gale, MRCP, PhD; Lorraine C. Kearney, BSc; Clyde B. Schechter, FACPM, MD; W. Paul Brooksby, FRCP, MD; Jim Nolan, FRCP, MD; Keith A.A. Fox, FRCP, MD; Adil Rajwani, MRCP, PhD; Wazir Baig, FRCP, MD; David Groves, PhD; Pauline Barlow, BSc; Anthony C. Fisher, MD; Phillip D. Batin, FRCP, MD; Matthew B. Kahn, MRCP; Azfar G. Zaman, FRCP, MD; Ajay M. Shah, FRCP, MD; Jon A. Byrne, MRCP, MD; Steven J. Lindsay, FRCP, MD; Robert J. Sapsford, FRCP, MD; Stephen B. Wheatcroft, MRCP, PhD; Klaus K. Witte, MRCP, MD; Mark T. Kearney, FRCP, MD

Table 3. Mode of Death

	Historic	Contemporary	*P*
All patients			
Sudden death	34 (43)	13 (9)	
Progressive heart failure	41 (53)	37 (26)	
Other cardiovascular	14 (18)	7.0 (5)	
Noncardiovascular	11 (14)	41 (29)	
Unclassifiable	0	2.8 (2)	
			$\chi^2<0.001$ Across groups
ICD recipients excluded			
Sudden death	34 (43)	8.1 (5)	
Progressive heart failure	41 (53)	37 (23)	
Other cardiovascular	14 (18)	8.1 (5)	
Noncardiovascular	11 (14)	44 (27)	
Unclassifiable	0	3.2 (2)	
			$\chi^2<0.001$ Across groups



Conclusions—Survival has significantly improved in patients with chronic heart failure caused by left ventricular systolic dysfunction over the past 15 years; furthermore, sudden death makes a much smaller contribution to mortality, and noncardiac mortality is a correspondingly greater contribution. This has been accompanied by an improvement in symptoms and some markers of adverse electric and structural left ventricular remodeling. (*Circ Heart Fail.* 2011;4: 396-403.)

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SCD/ PP

- •ACEI (SOLVD - 23% NSS, V-HeFT - 31% NSS, CHFSTAT -52% NSS)
- • ACEI therapy – lower risk of SCD
- • more than 50% pts. treated ACEI can profit from SCD prophylaxis
- •amiodaron (CHFSTAT,CAMIAT, EMIAT)
- •Do not prolong survival with LV dysfunction
- •BB (CIBIS II, BEST, MERIT-HF)
- • downgrade risk of SCD
- • prolong survival of pts with CHF

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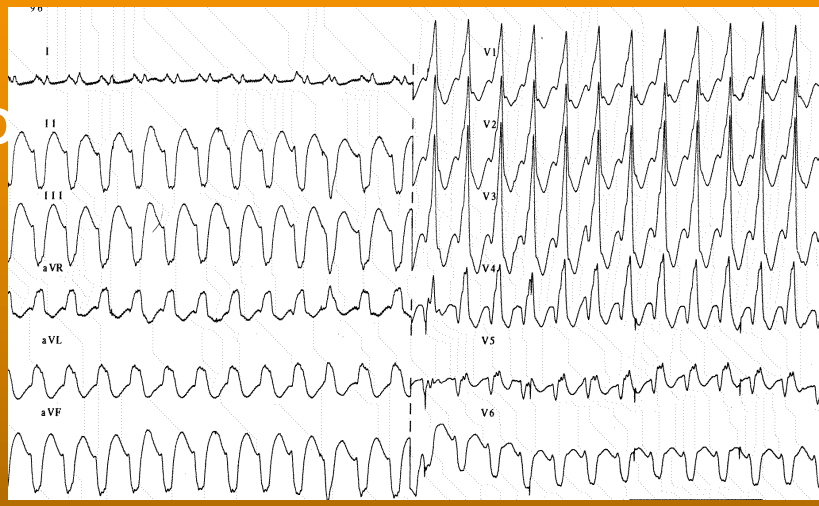
SCD PREVENTION

- OPT + revascularization CAD
- ICD / CRT ICD
- RFA
- Heart transplant
- Surgery of CHF (MVP, aneurysmectomy)



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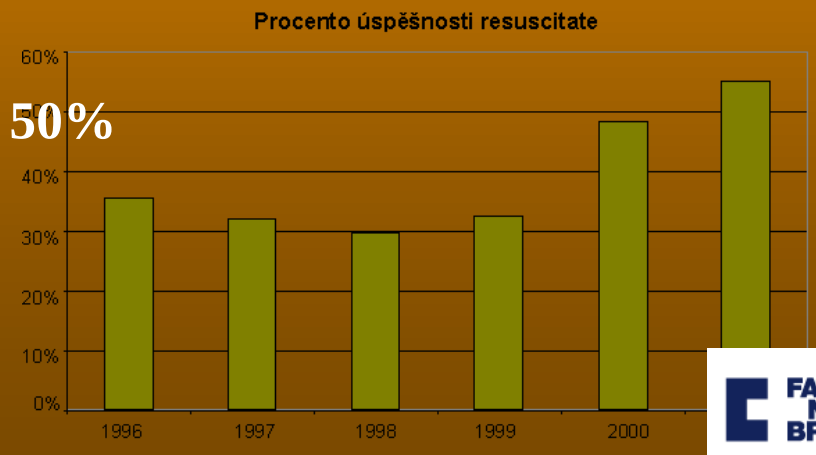
Profile of resuscitated patient

Who?

CAD (1. manifestation)	64 - 90 % (25 %)
64 years old man	81 %
MI in anamn.	45%

Cobb et al, Circulation, 1992



1996 2001

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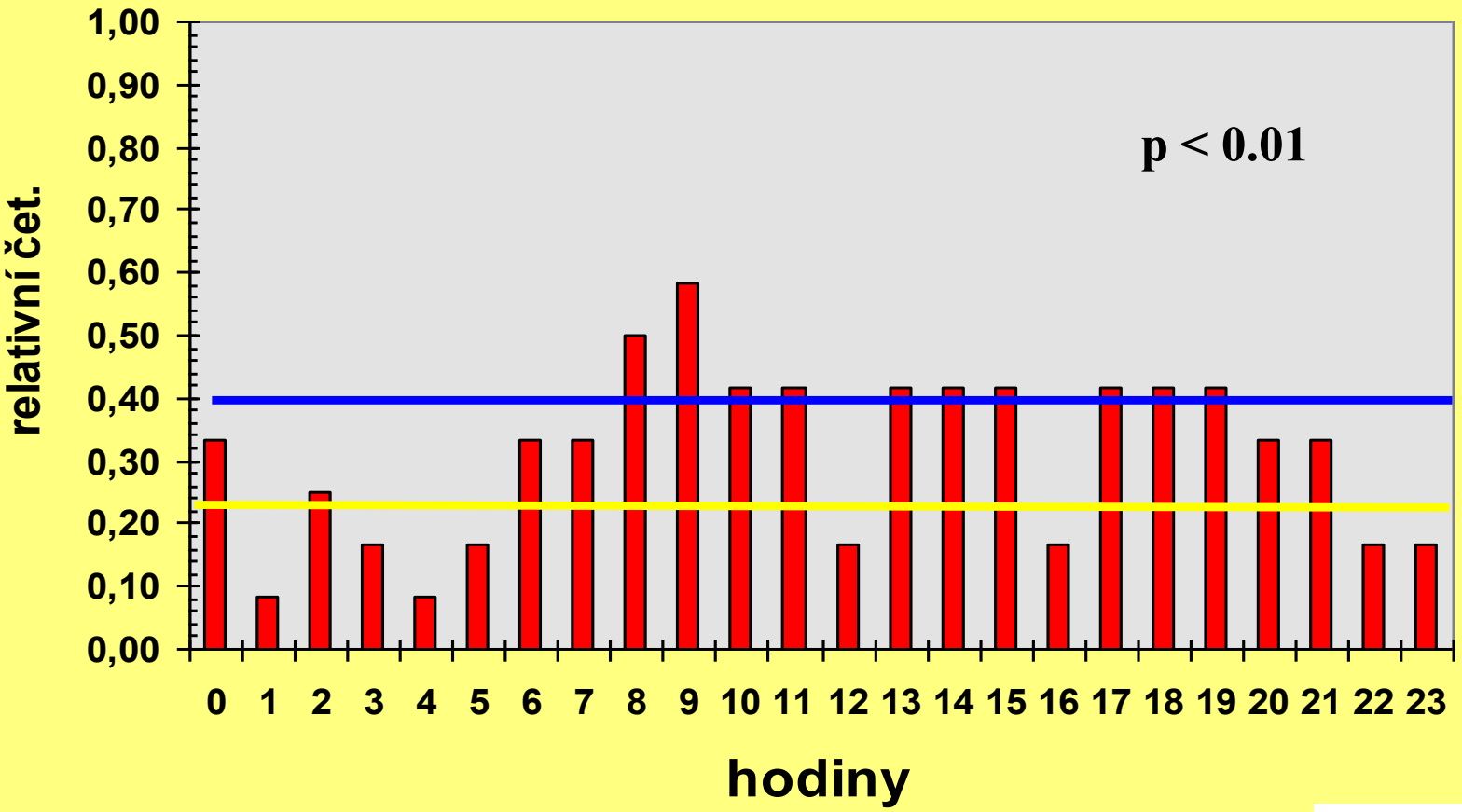
CIRCADIAN OCCURENCE

N = 72

n = 506

When?



M.Kozak et al., PACE 2003

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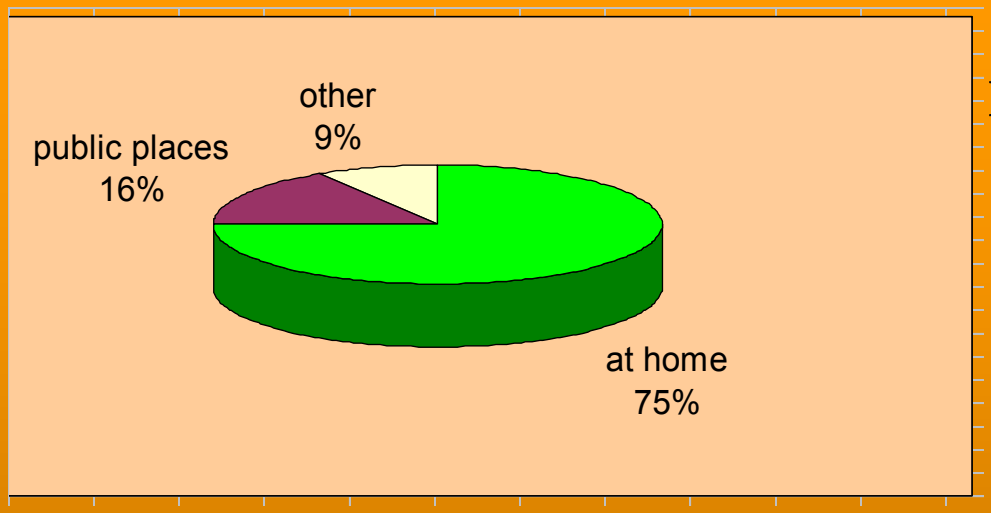
Where?

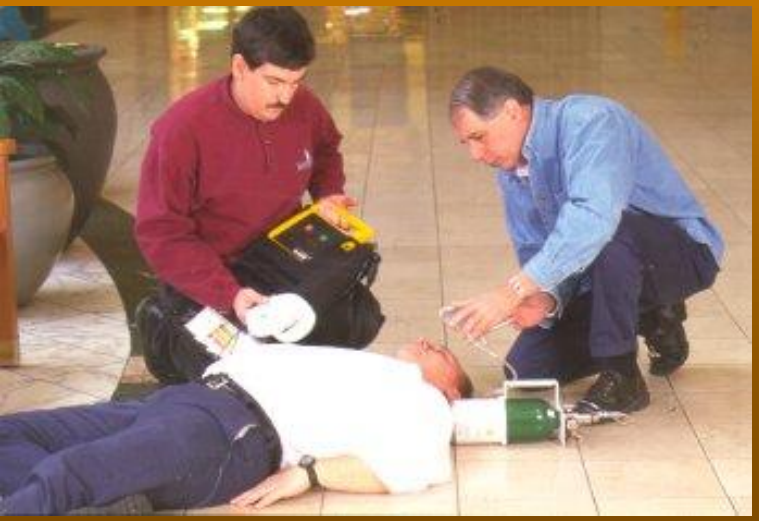


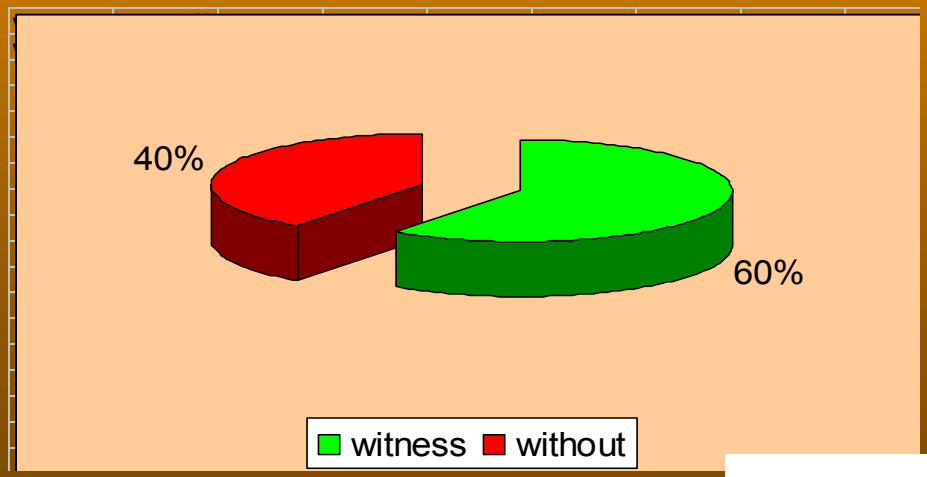
Incidence => 0.03 (30 places = 1 CA)

- **airports**
- **industrial zones**
- **golf clubs**
- **fitcenters**
- **casinas**

Atkins et al. Prehospital Disaster Med 1996, 11:47-49

Becker et al. Circulation. 1998,97:2106-2109





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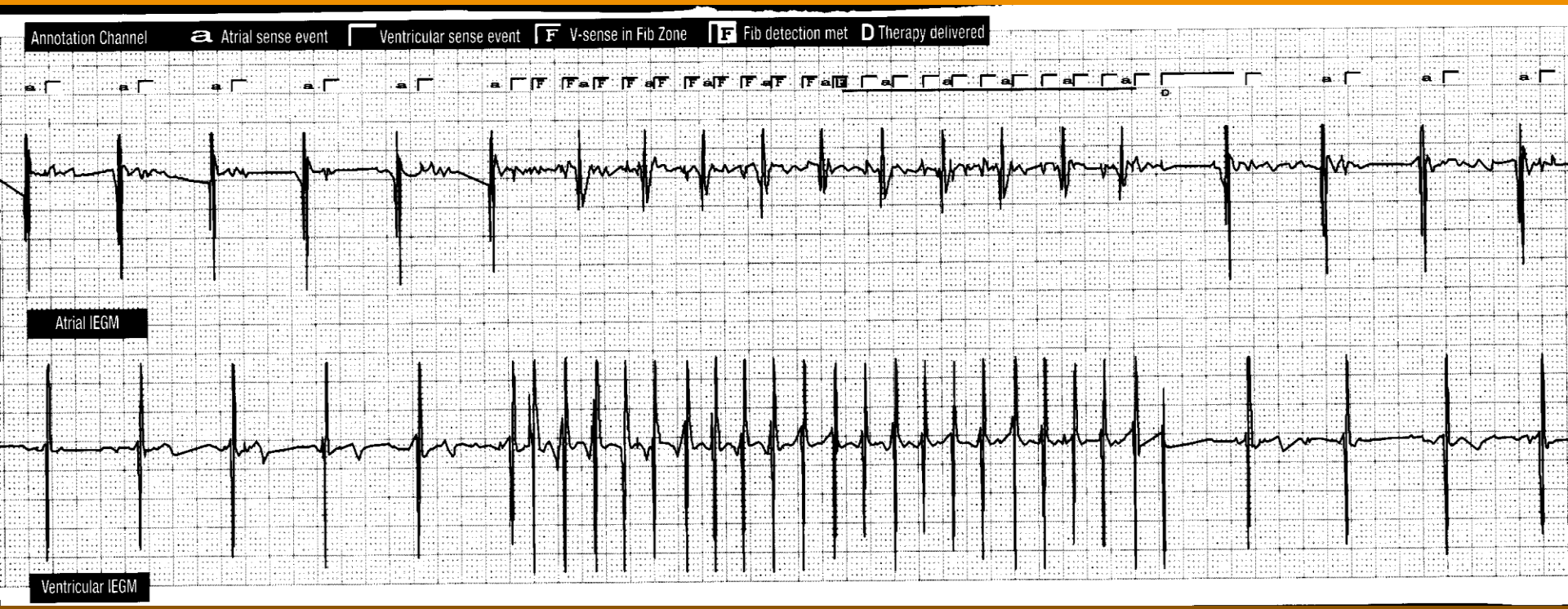
ICD IN SECONDARY PREVENTION OF SCD

ČR -75/1mil

FAKULTNÍ NEMOCNICE BRNO

ICD IN SECONDARY PREVENTION OF SCD



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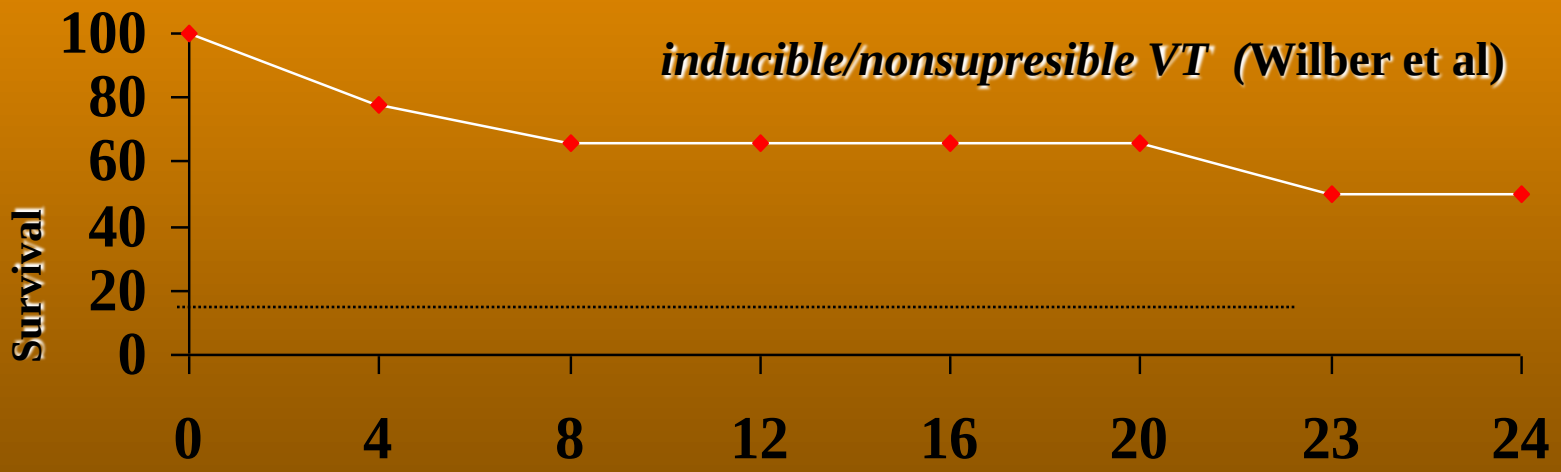
ICD - PRIMARY PREVENTION

CAD + NSVT

- MI + NSVT + LV dysf. = 2 year mortality > 30%
- MI + NSVT + LV dysf. + EPS + = 50%



1. Anderson. CIRC 1978
2. Bigger. CIRC 1984
3. Buxton. Am J C 19
4. Wilber CIRC 1990

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For which patient?

- **A number of previous ICD studies* indicate patients are remarkably similar with respect to:**
  - **Age**
  - **Left Ventricular Ejection Fraction**
  - **Percentage with Coronary Artery Disease**
  - **NYHA classification**

Prophylactic patient is not different

*Sources: Moss, A, et al; *N Engl J Med* 1996; 335: 1933-40

Buxton, A, et al; *N Engl J Med* 1999; 341: 1882-90

AVID Investigators; *N Engl J Med* 1997; 337: 1576-83

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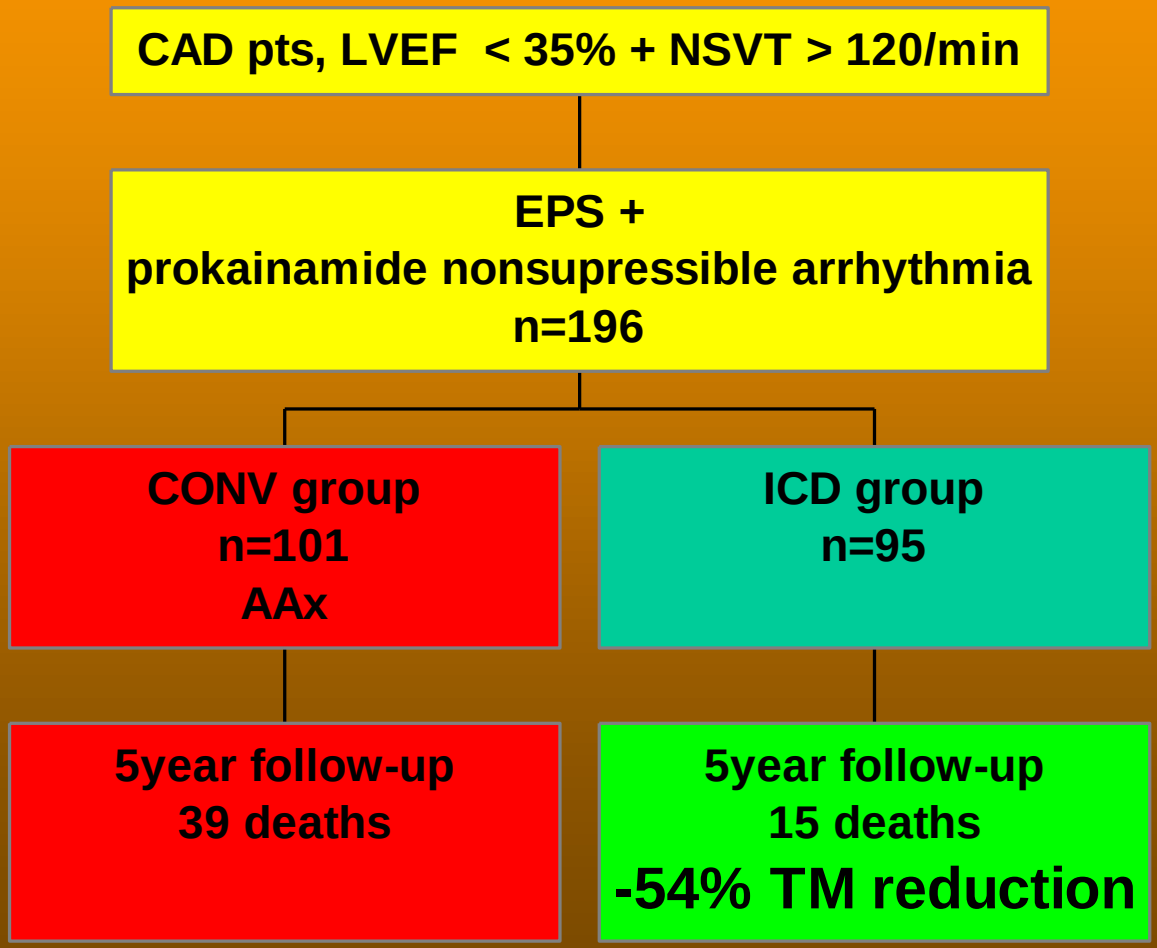
ICD IN PRIMARY PREVENTION OF SCD

MADIT

Schema of study



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ICD - PRIMARY PREVENTION

- **Documented episodes of NSVT in CAD post MI patients and LVEF < 0.35, sustained VT inducible in EPS.**

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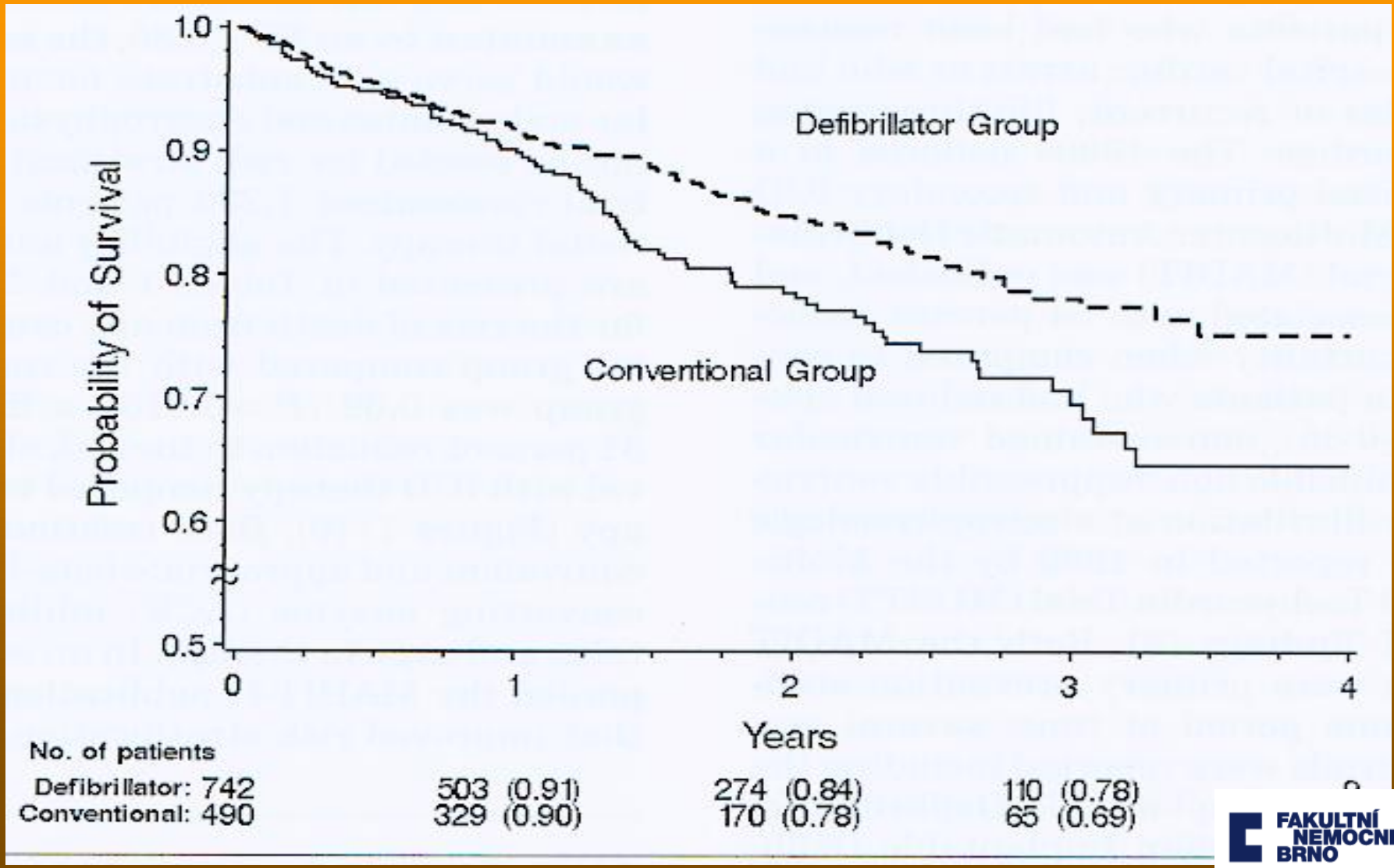
ICD IN PRIMARY PREVENTION OF SCD

MADIT II



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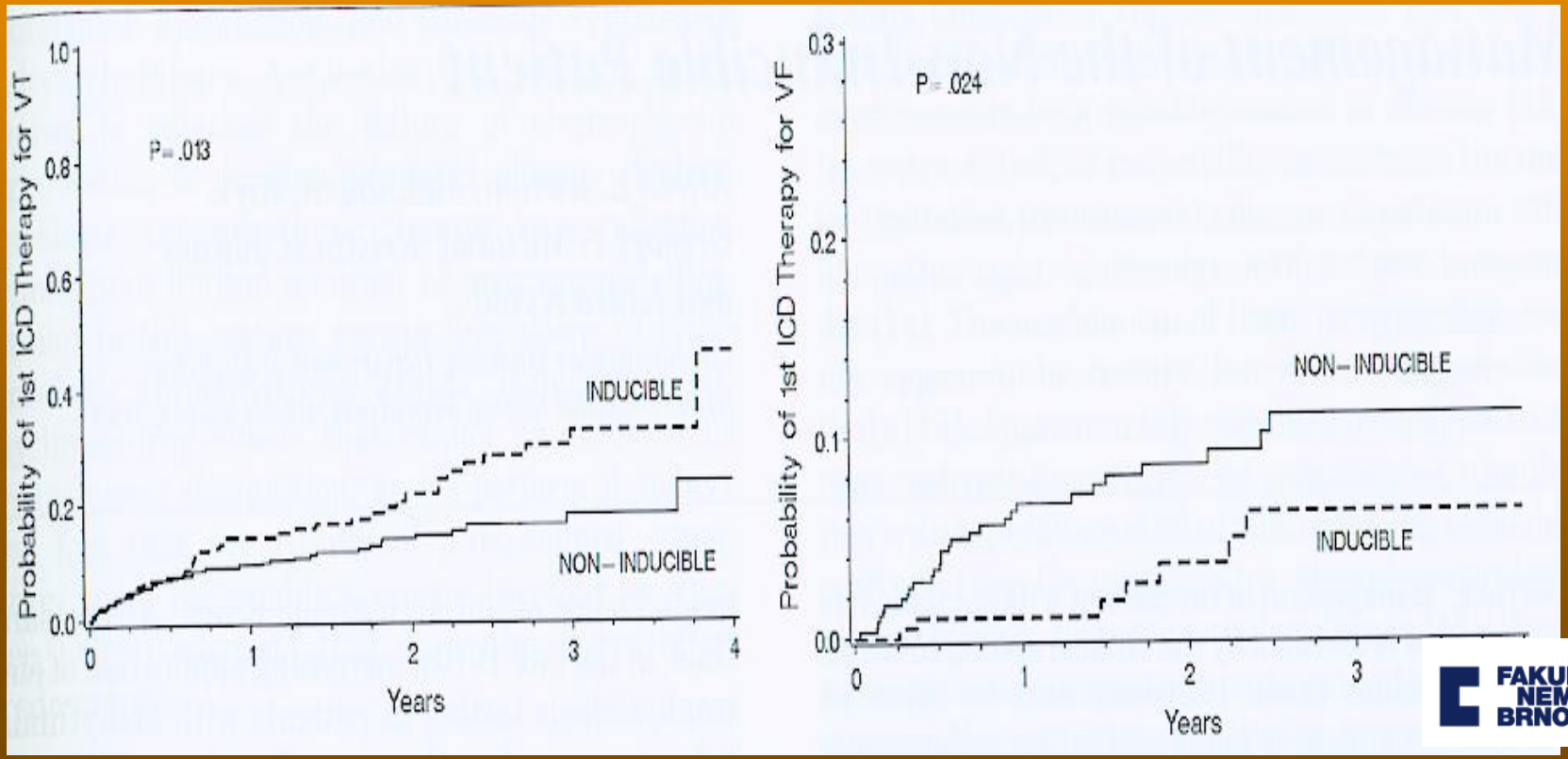
Moss AJ et al, CEPR 2002, 6(4), 463-465

ICD IN PRIMARY PREVENTION OF SCD

MADIT II

- ICD group (N=742) — 105 (14,2%) deaths
- CONV therapy (N=490) — 97 (19,8%)
- 31% reduction of deaths in ICD group
- 63% reduction of mortality - QRS > 120 ms



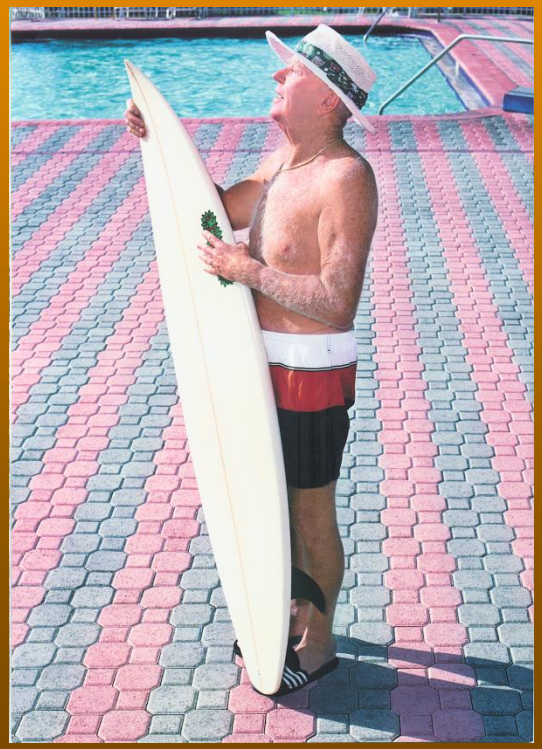
FAKULTNÍ NEMOCNICE BRNO

Moss AJ et al, CEPR 2002, 6(4), 463-465

ICD IN PRIMARY PREVENTION OF SCD

- **4.12.5.**

CAD post MI, LV dysfunction, LVEF < 0.30, QRS > 120ms, NYHA II, 6 m post IM, standard pharmacotherapy (bb)



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ICD IN PRIMARY PREVENTION OF SCD - CZ

•2010 – 2019 - 75% primary preventive implantation

- 2004 5,5%
- 2005 7%
- 2006 22,8%
- 2007 34 %
- 2008 39%
- 2009 46%

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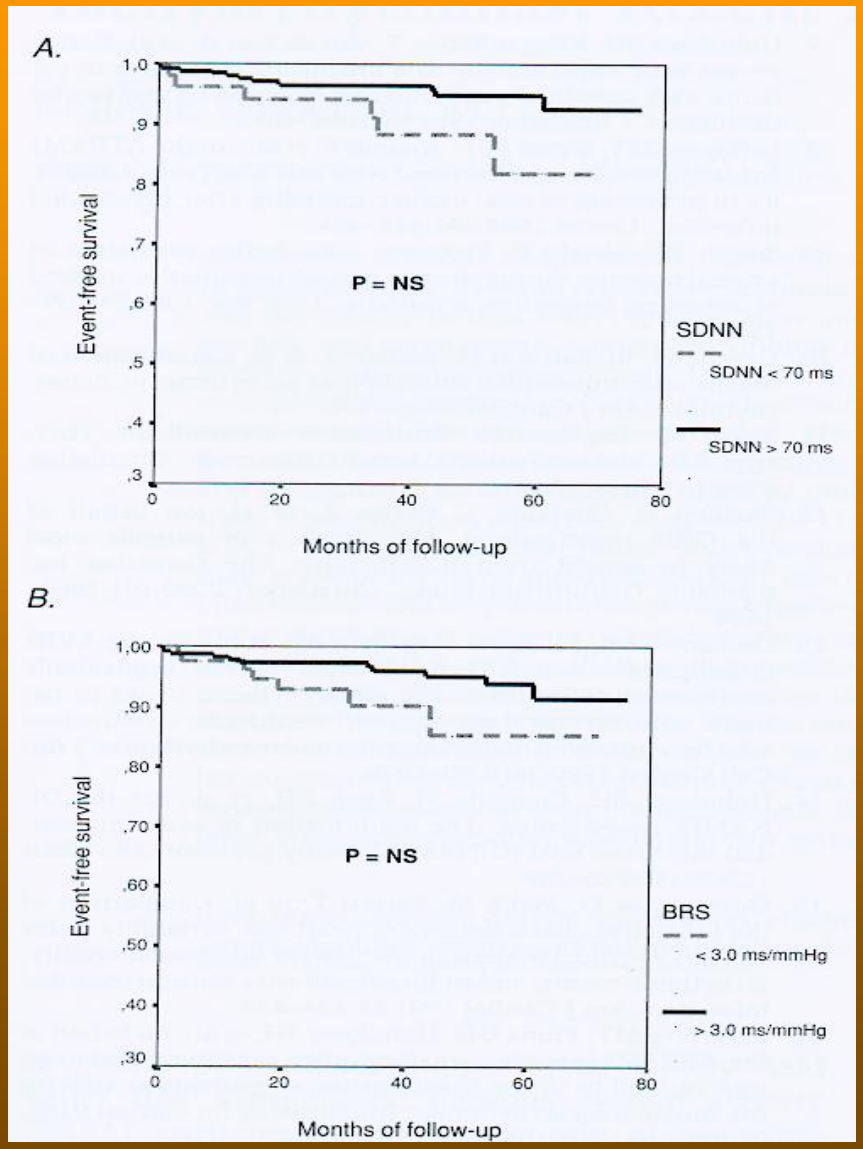
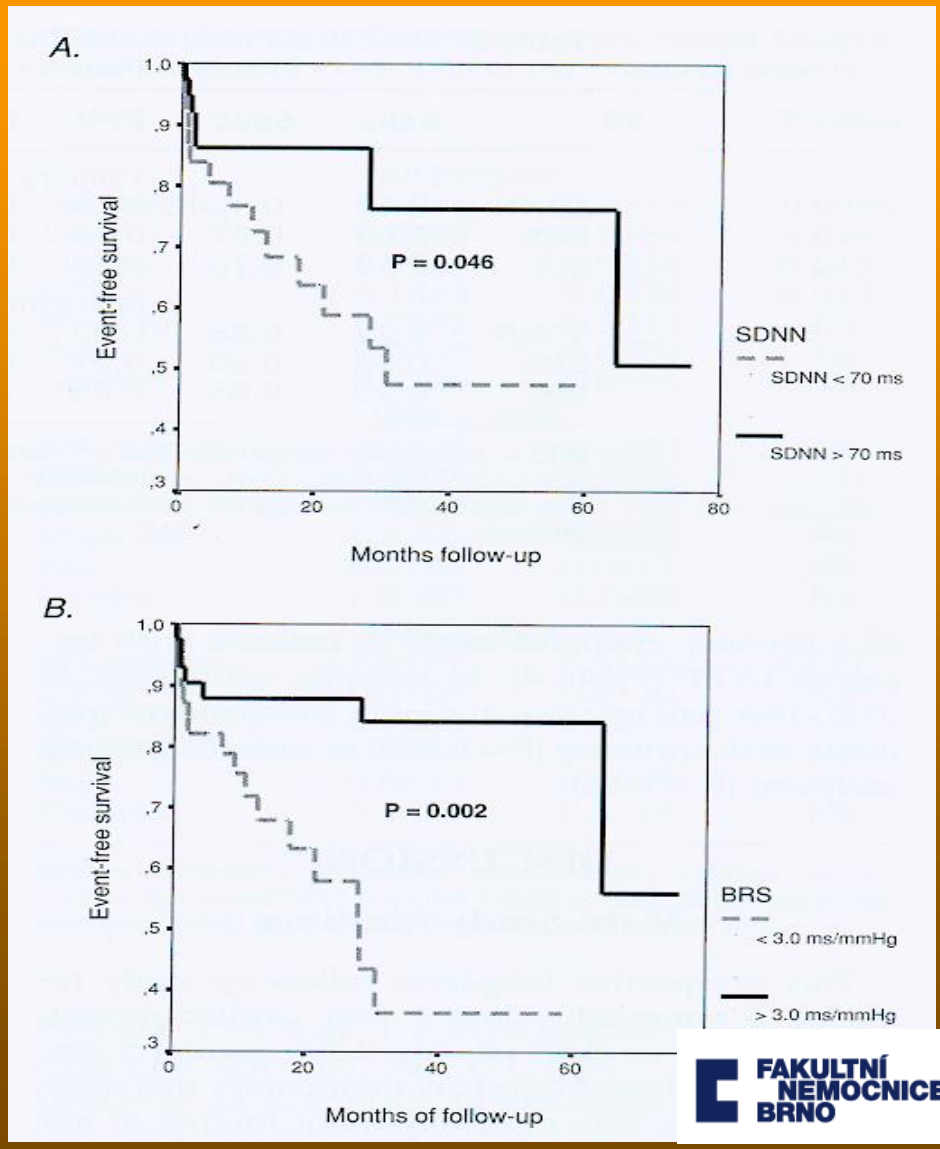
RISK STRATIFICATION

Klingenheben et al., A.N.E.2003,8(1):68-74





LVEF > 35%

LVEF < 35%

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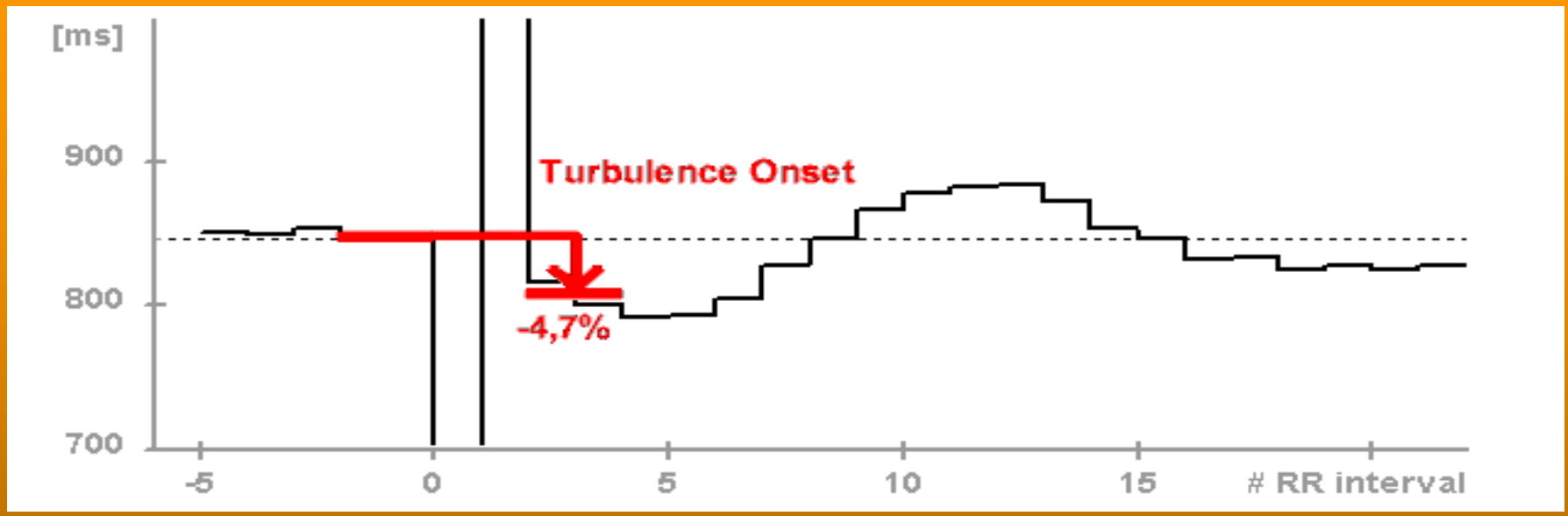
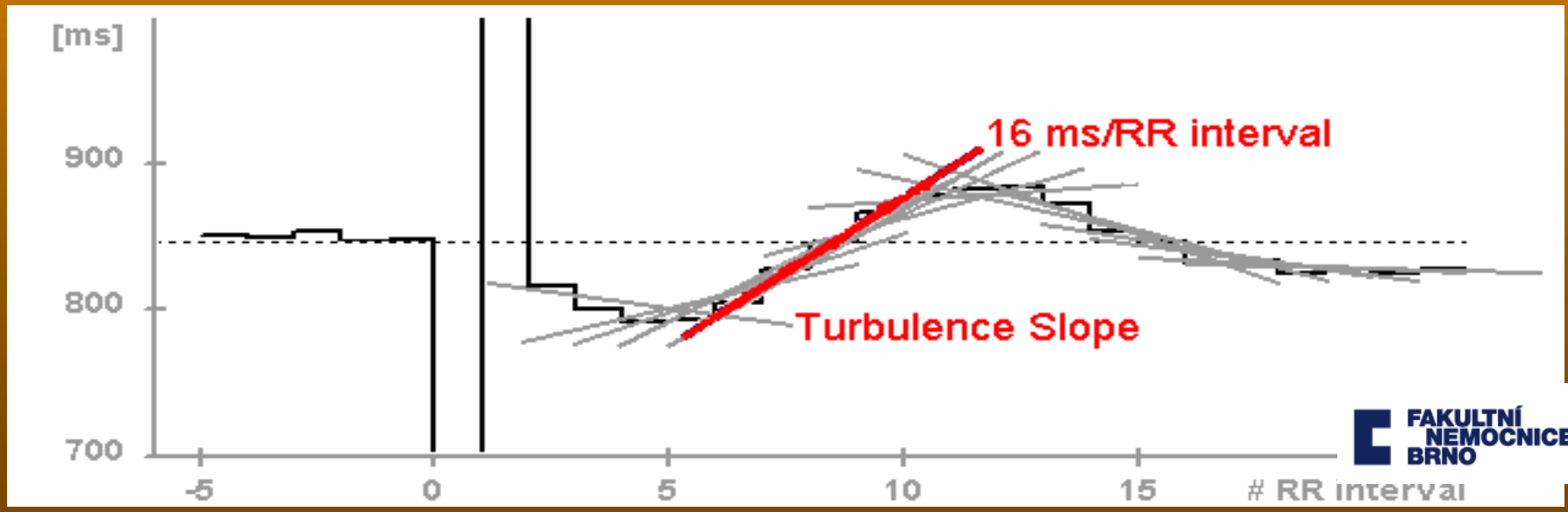
RISK STRATIFICATION

HRT





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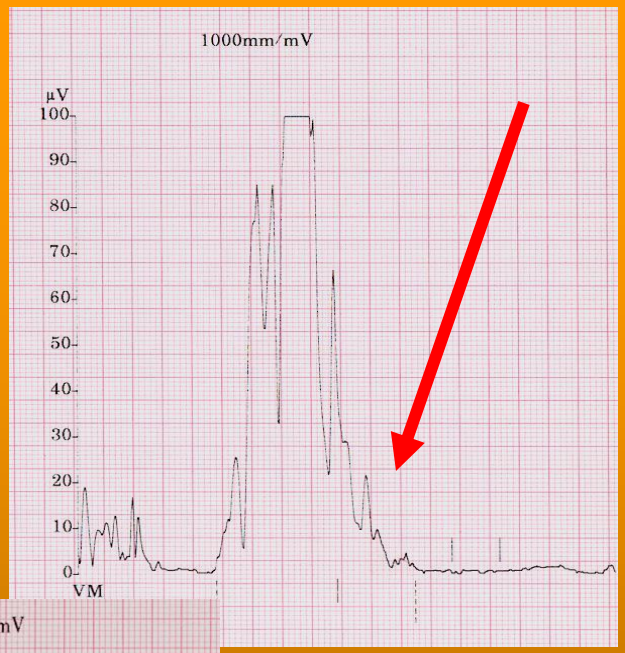
RISK STRATIFICATION

- **PPV - 30%**
- **NPV - 96%**



Steinberg JS., Regan A., Sciacca R.,et al., Am J Cardiol 1992;69:13-21

Breithardt G., Schwartzmaier J., Borggrefe M.,etal., Eur Heart J 1983;4:487-95

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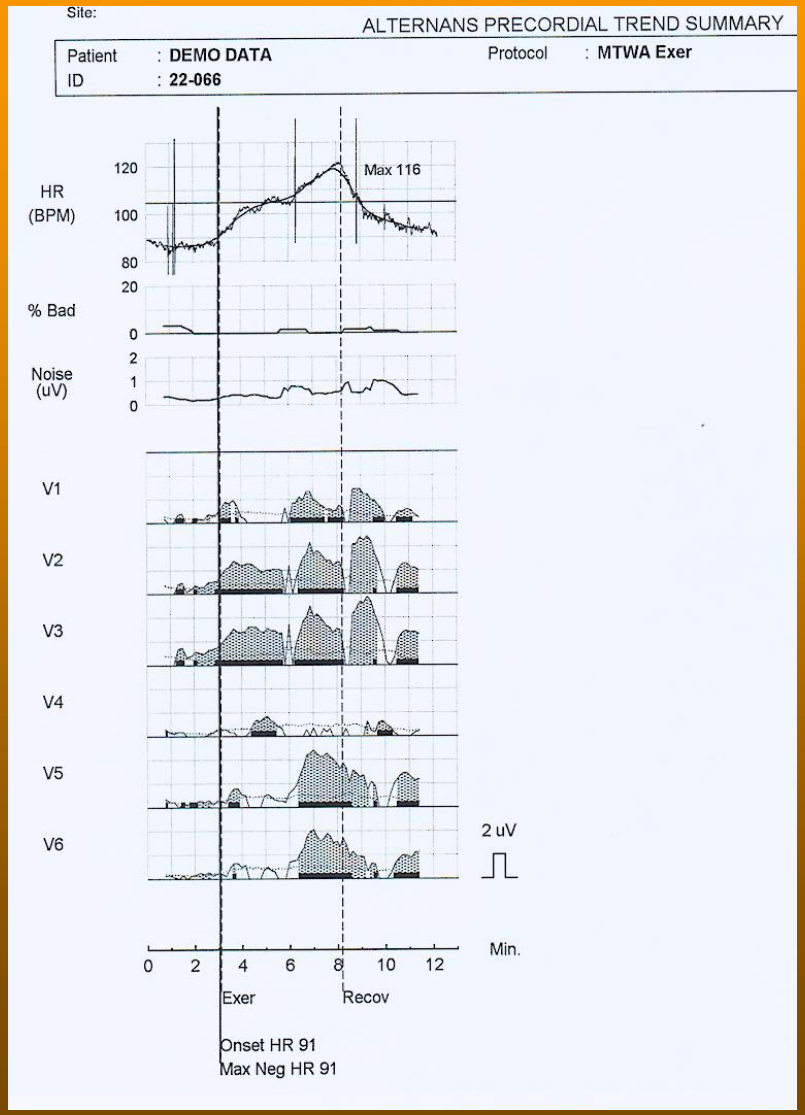
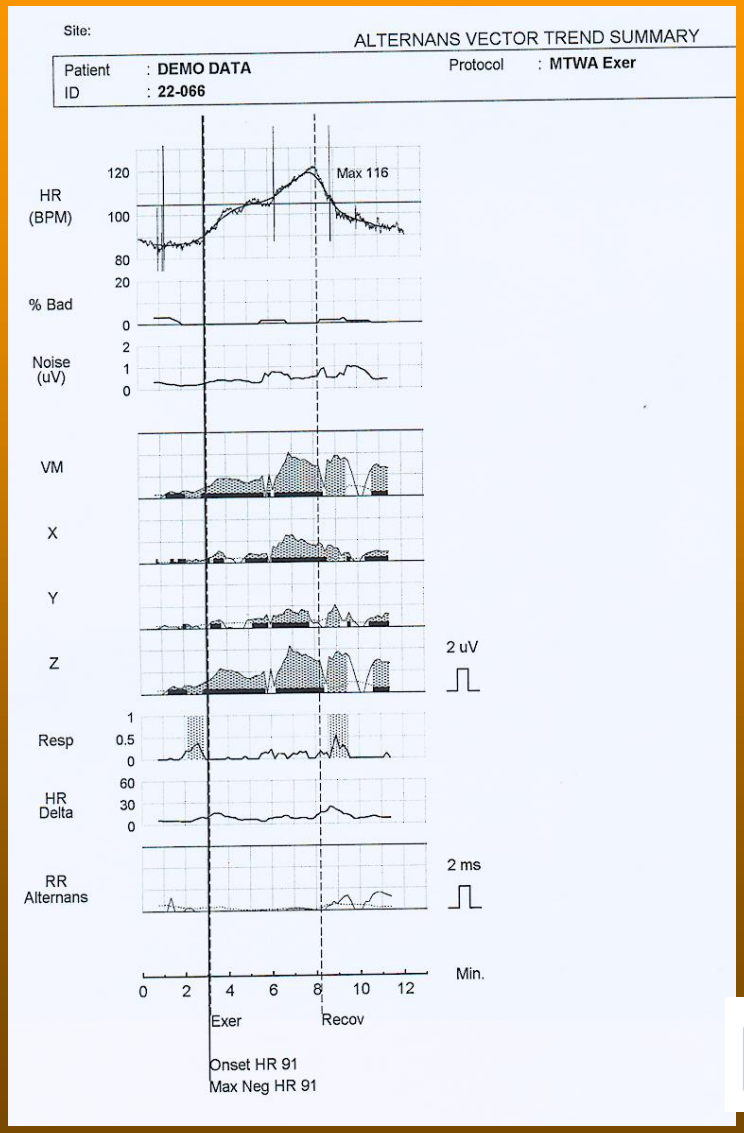
RISK STRATIFICATION

TWA





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RISK STRATIFICATION

Journal of the American College of Cardiology
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Published by Elsevier Inc.

ACC/AHA/ESC PRACTICE GUIDELINES—EXEC

ACC/AHA/ESC 2006 Guidelines
of Patients With Ventricular Arrhy
Prevention of Sudden Cardiac Deat

A Report of the American College of Cardiology
Force and the European Society of Cardiology C
(Writing Committee to Develop Guidelines for
Ventricular Arrhythmias and the Prevention of S
Developed in Collaboration With the European
Heart Rhythm Society

VII. ELECTROCARDIOGRAPHIC TECHNIQUES AND MEASUREMENTS

Recommendations

Class IIa

It is reasonable to use T-wave alternans for improving the diagnosis and risk stratification of patients with ventricular arrhythmias or who are at risk for developing life-threatening ventricular arrhythmias. ***(Level of Evidence: A)***

Class IIb

ECG techniques such as signal-averaged ECG, heart rate variability, baroflex sensitivity, and heart rate turbulence may be useful for improving the diagnosis and risk stratification of patients with ventricular arrhythmias or who are at risk of developing life-threatening ventricular arrhythmias. ***(Level of Evidence: B)***

ICD trials, especially Multicenter Automatic Defibrillator Implantation Trial (MADIT) II, have highlighted the need to develop novel tools in order to identify patients at highest risk of ventricular arrhythmias and SCD. Numerous modalities exist at present for assessing this risk but only 2 are currently approved by the U.S. Food and Drug
istration: signal-averaged ECG and T-wave a
However, heart rate variability and baroflex sensiti
show considerable promise.

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TABLE 3 Association of the Composite Autonomic Index (created by combining TO, TS, BRS, and SDNNI) With FCA/NFCA Using Cox's Univariate Regression Analysis

	(FCA/NFCA)/Total	RR (95% CI)	p Value
Variables Combined into a Single Index With Five Categories (each compared with all factors normal)			
Combined variable		—	<0.0001
All factors normal	14/552	1	—
Any 1 factor abnormal	10/228	1.71 (0.76–3.85)	0.194
Any 2 factors abnormal	4/63	2.84 (0.93–8.63)	0.066
Any 3 factors abnormal	5/40	5.16 (1.86–14.33)	0.0016
All 4 factors abnormal	5/15	16.79 (6.01–46.89)	<0.0001
Composite Autonomic Index Dichotomized to Create Four New Variables, In Which the Abnormal Category Is Compared With Rest of Study Population			
≥1 factor abnormal	24/346	2.82 (1.46–5.45)	0.002
≥2 factors abnormal	14/118	4.32 (2.23–8.36)	<0.0001
≥3 factors abnormal	10/55	5.99 (2.91–12.33)	<0.0001
All 4 factors abnormal	5/15	11.31 (4.39–29.16)	<0.0001

•Ghuran Am J Cardiol 2002

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CONCLUSION

- **Prophylactic ICD patient is not different to the general ICD population**
- **NNT ratio is low and reduced in time**
- **ICD therapy is cost effective**
- **Prophylactic pts require a full featured device, just like any other pt**

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CONCLUSION

- No of PP ICD implantation is growing
- Each fifth pt in CZ is implanted from PP reasons
- The most frequent - combined indication PP ICD + CRT

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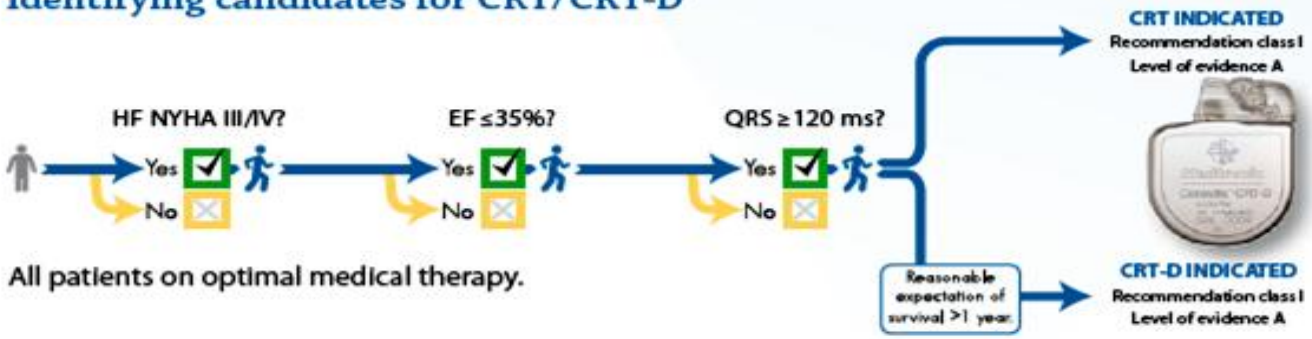
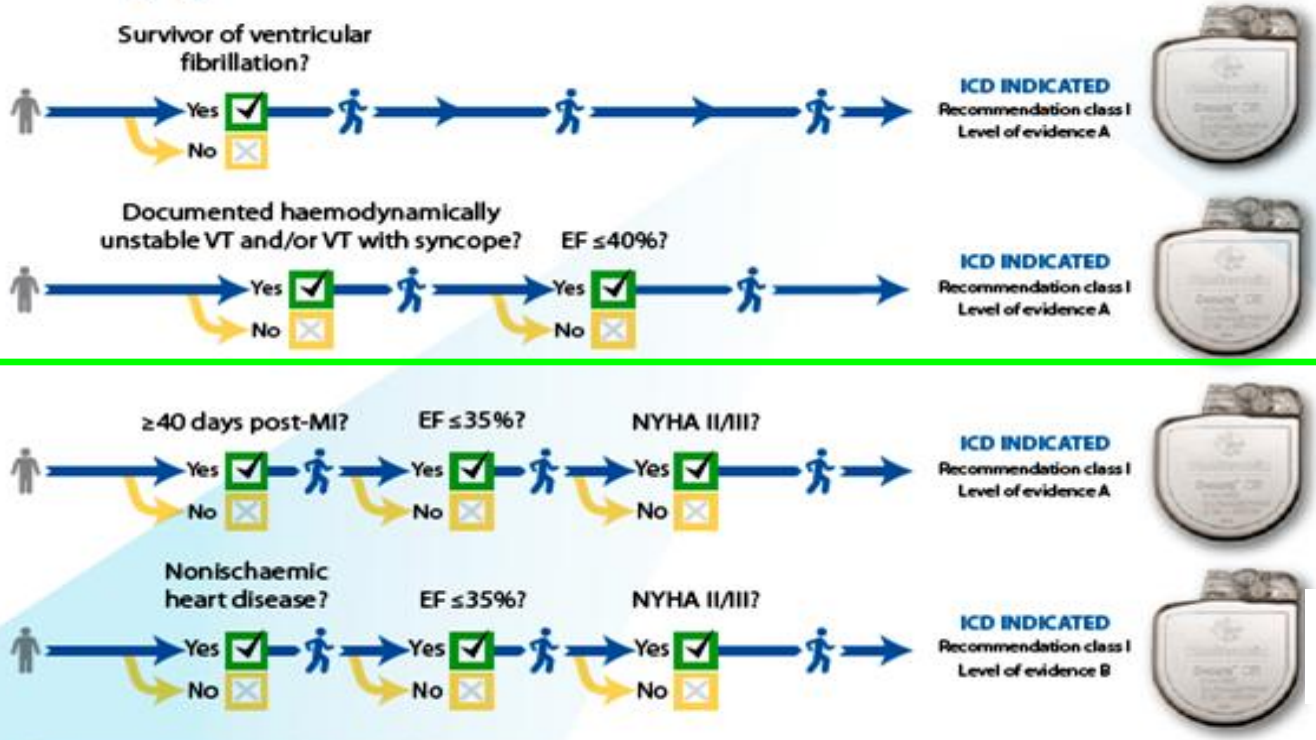
Recognising candidates for Heart Failure device therapies as indicated in ESC treatments guidelines

Identifying candidates for CRT/CRT-D



All patients on optimal medical therapy.

Identifying candidates for ICD



All patients on optimal medical therapy with reasonable expectation of survival > 1 year.

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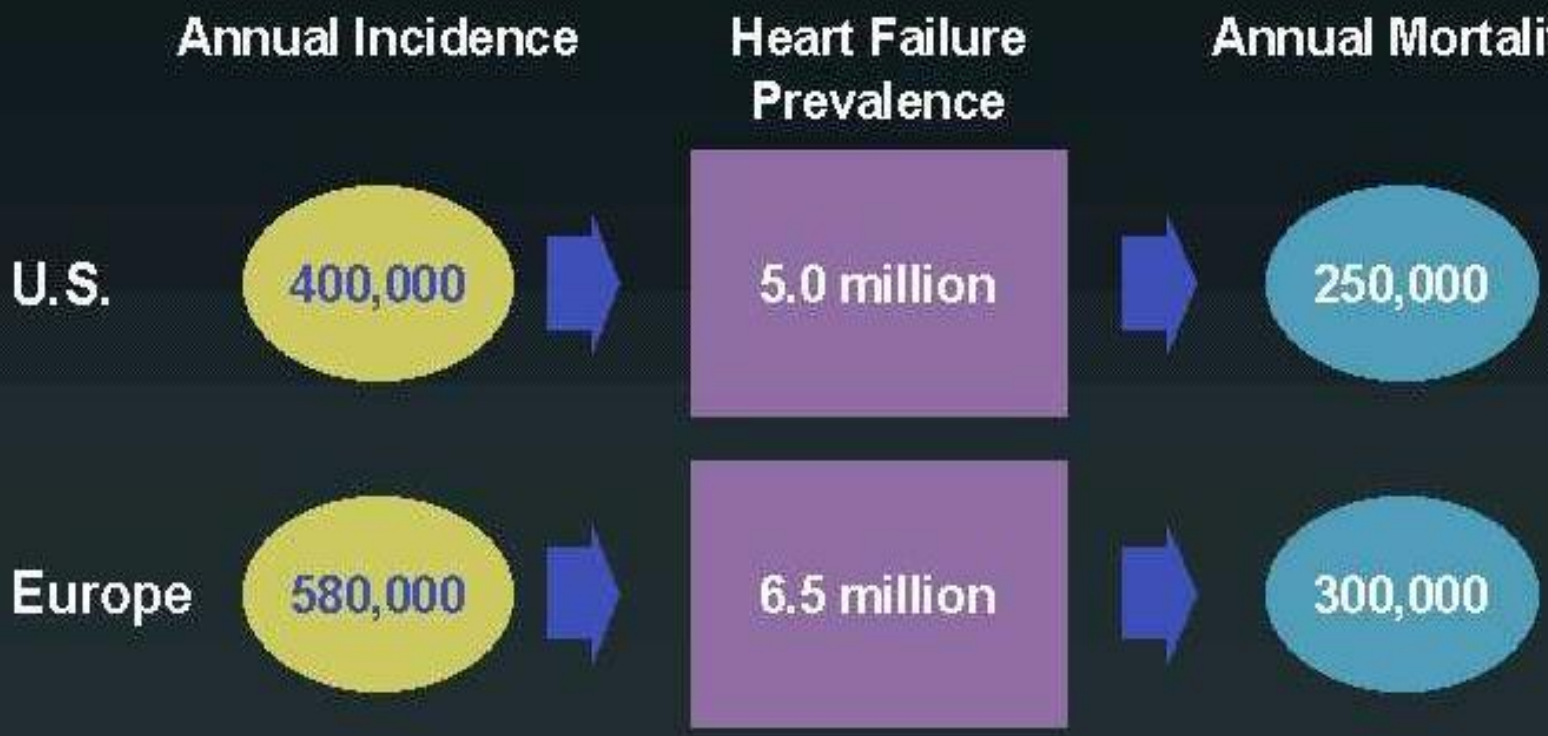
Heart Failure Management

A Growing Medical Challenge



Congestive heart failure worldwide markets, clinical status and product development opportunities. *New Medicine, Inc.* 1997;1-40.
Wilkerson Group Survey, 1998.

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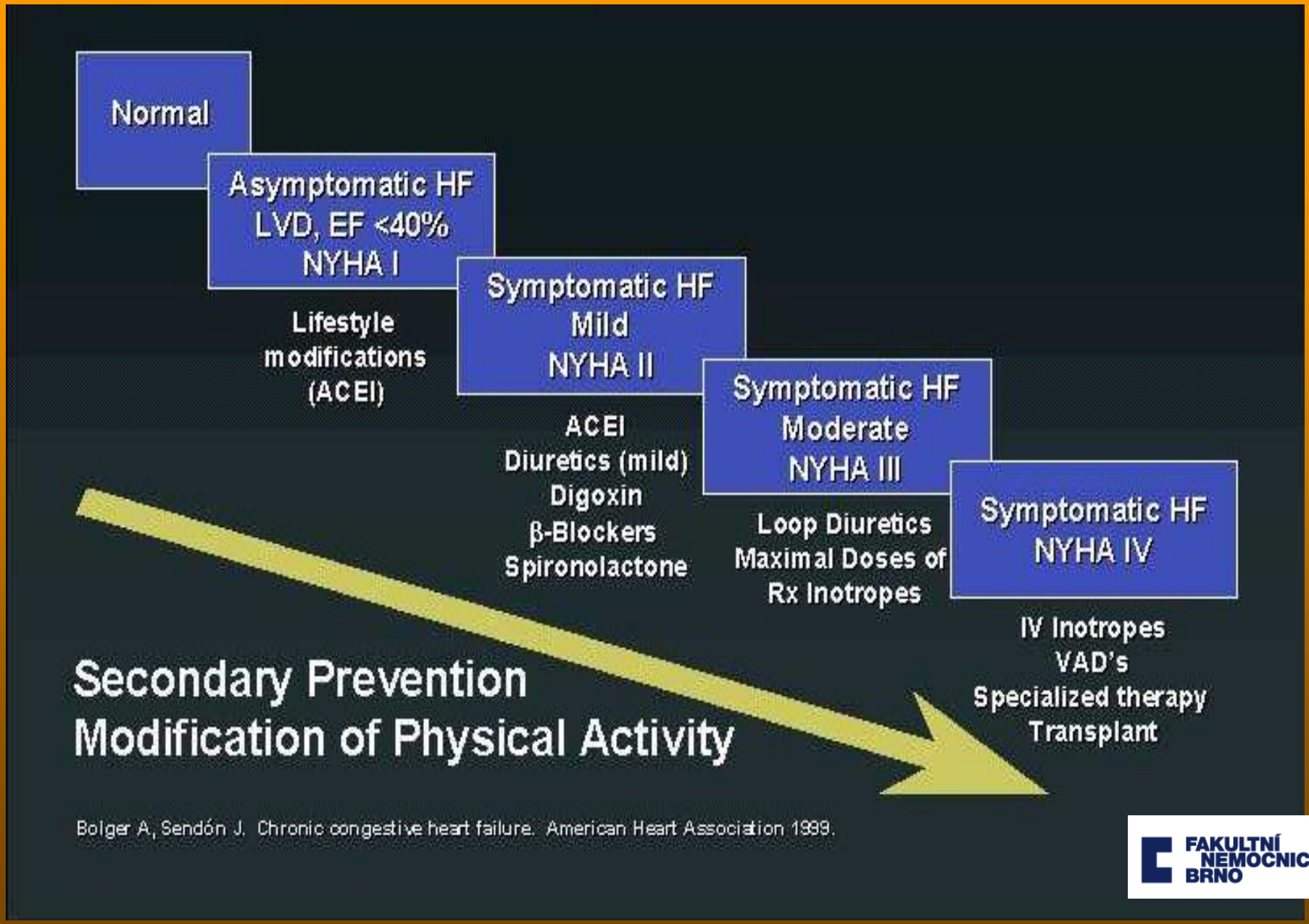

Bolger A, Sendón J. Chronic congestive heart failure. American Heart Association 1999.

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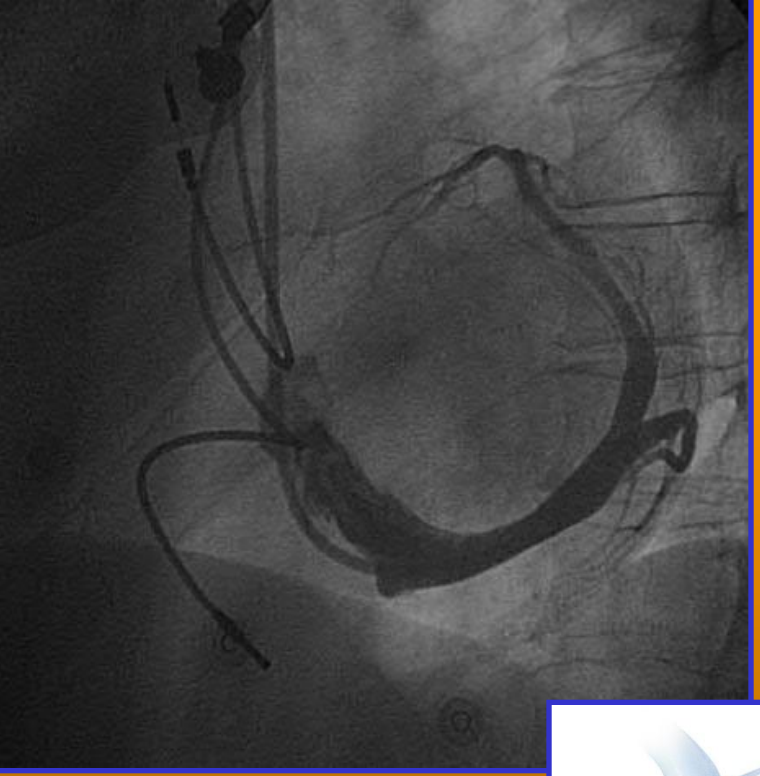
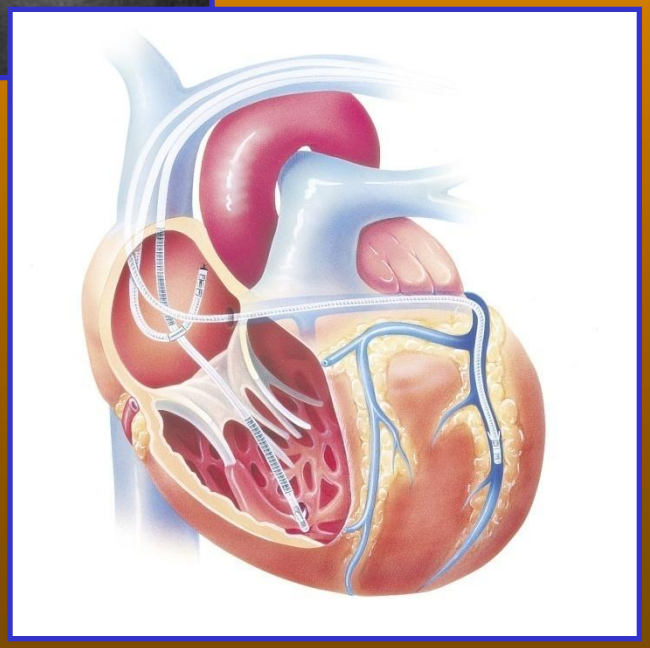
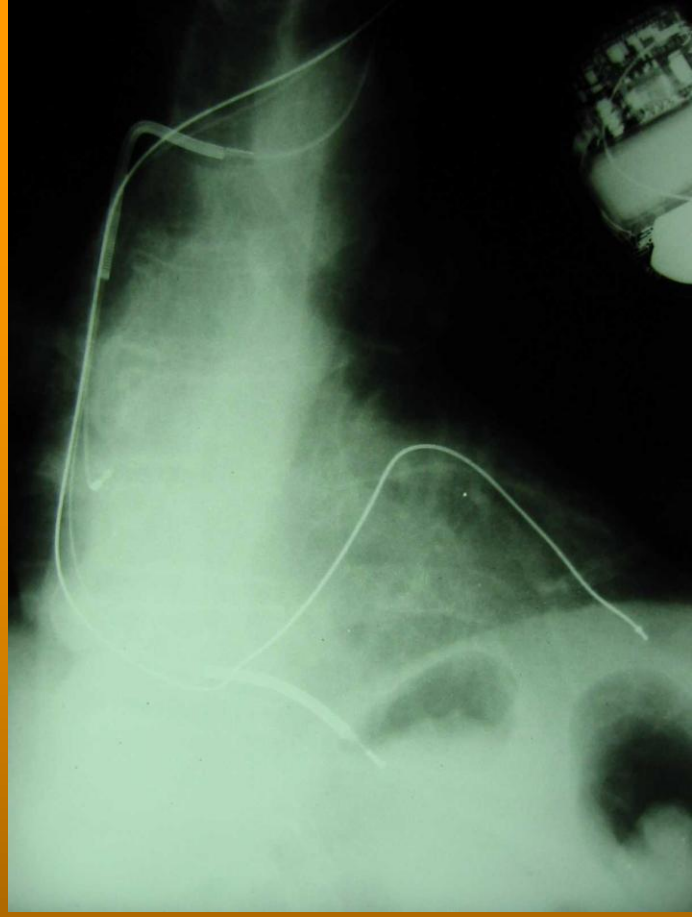


CRT





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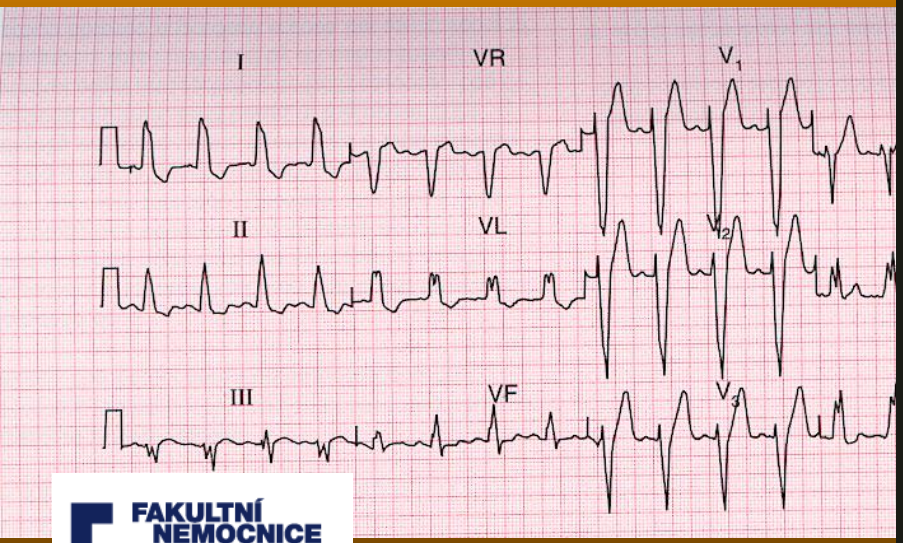
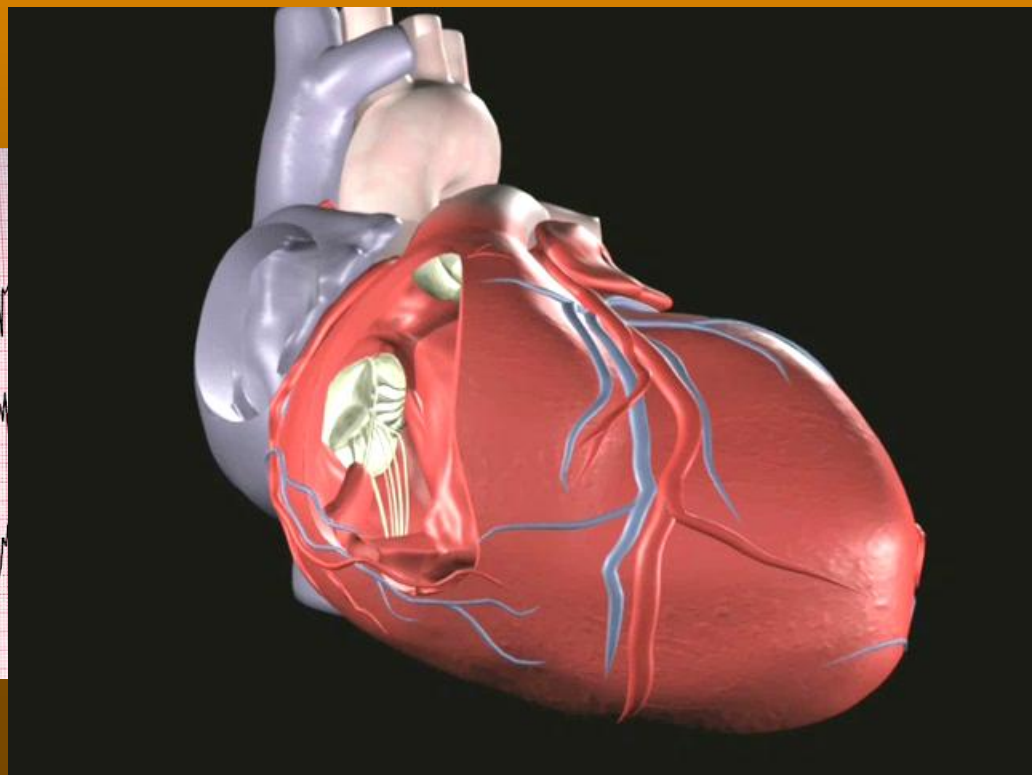
CRT INDICATION

- **4.10. HF, stand. Rx 6 months (NYHA II/ III 6 m, NYHA IV)**

  LVEF < 35%, QRS > 150 ms, 120-150ms, dyssynchrony





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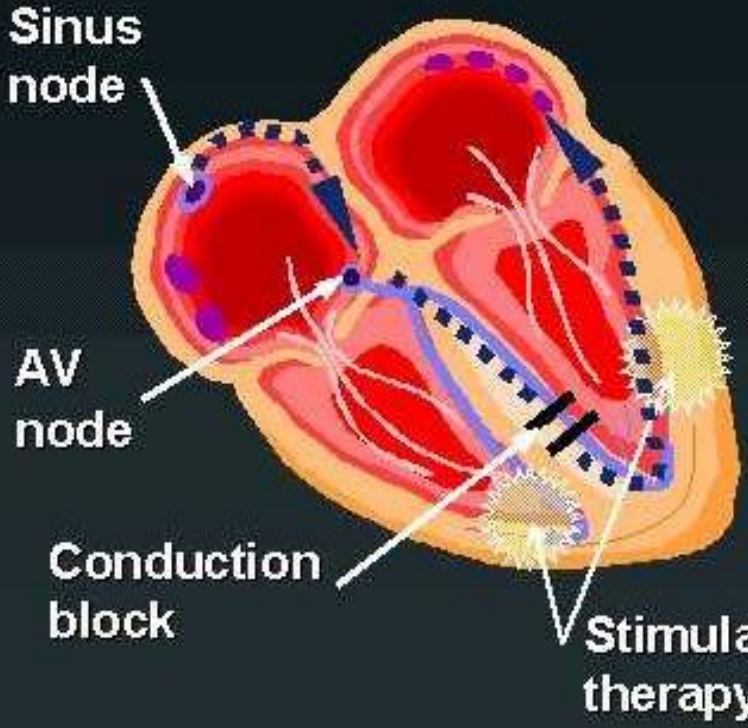
Mechanism II

Restoring Intraventricular Coordination



Intraventricular Activation

- Organized ventricular activation sequence
- Coordinated septal and freewall contraction
- Improved cardiac efficiency

Kass D. New dimensions in device-based therapy for heart failure–mechanisms of stimulation for heart failure. Heart Failure Society of America 1999.

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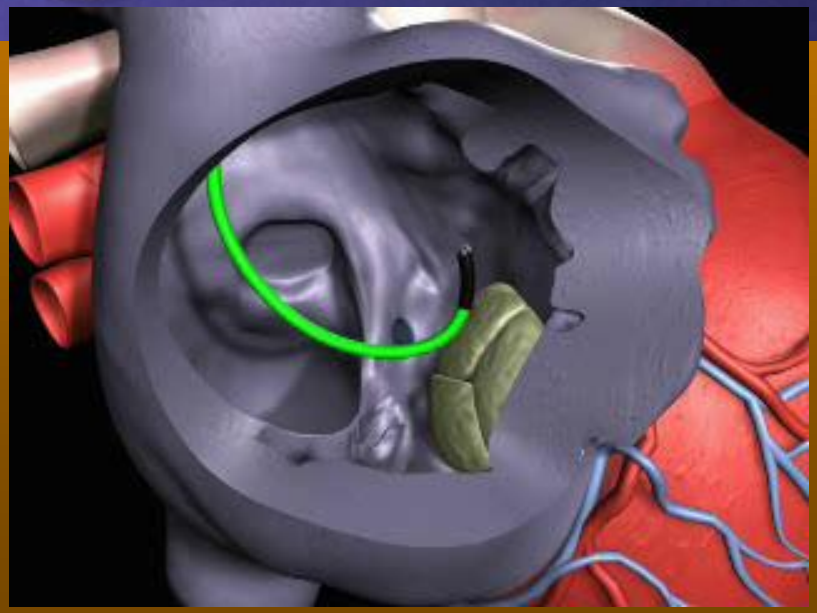

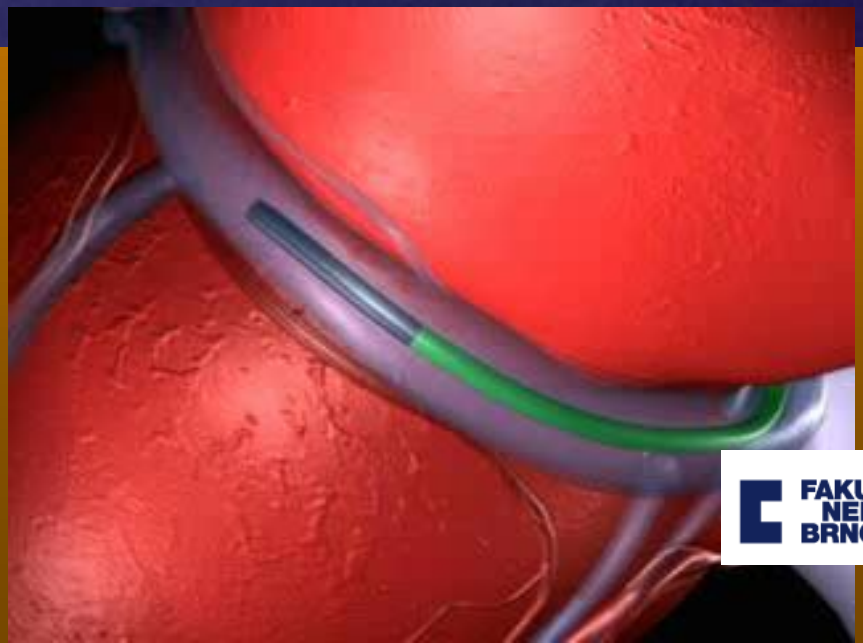

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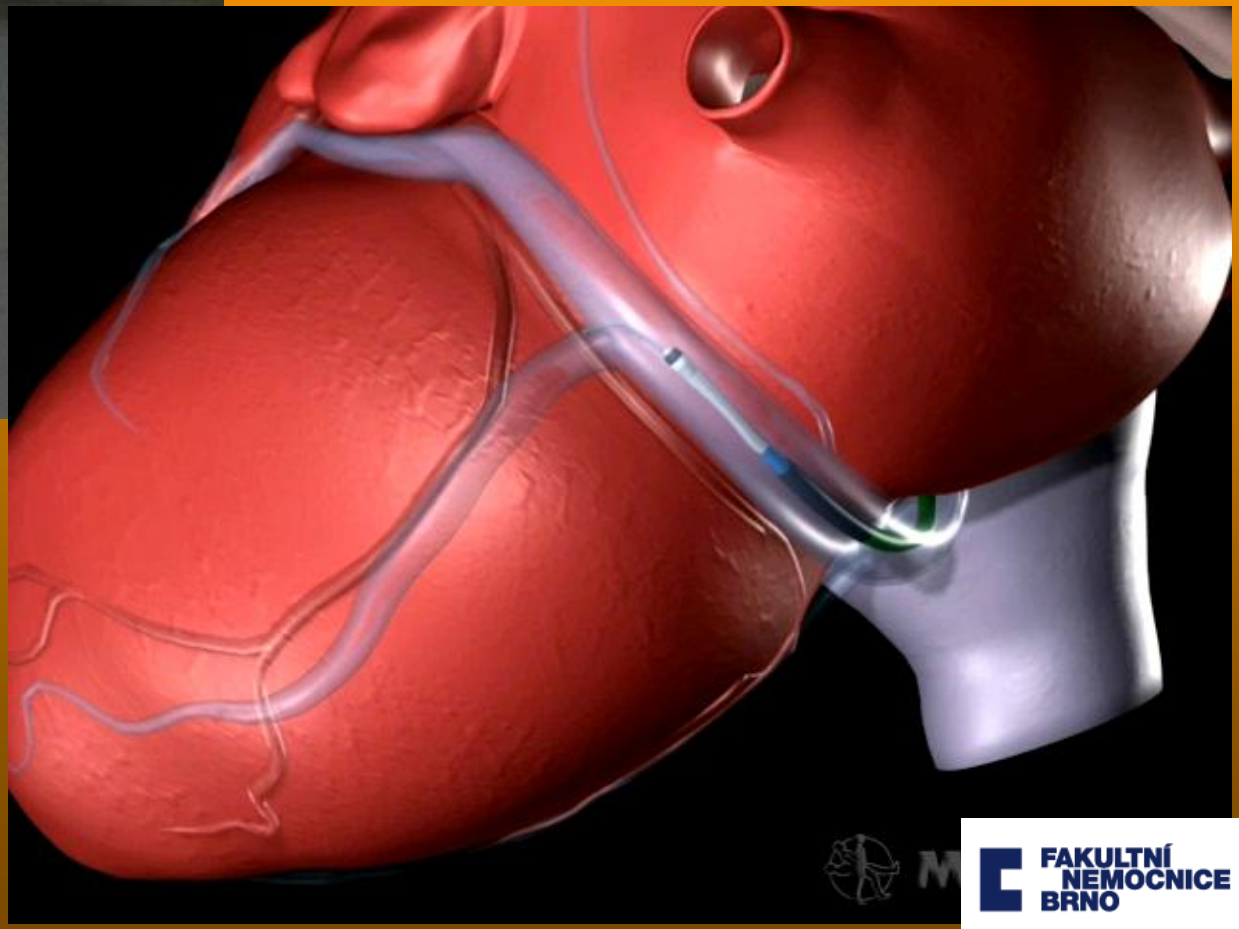

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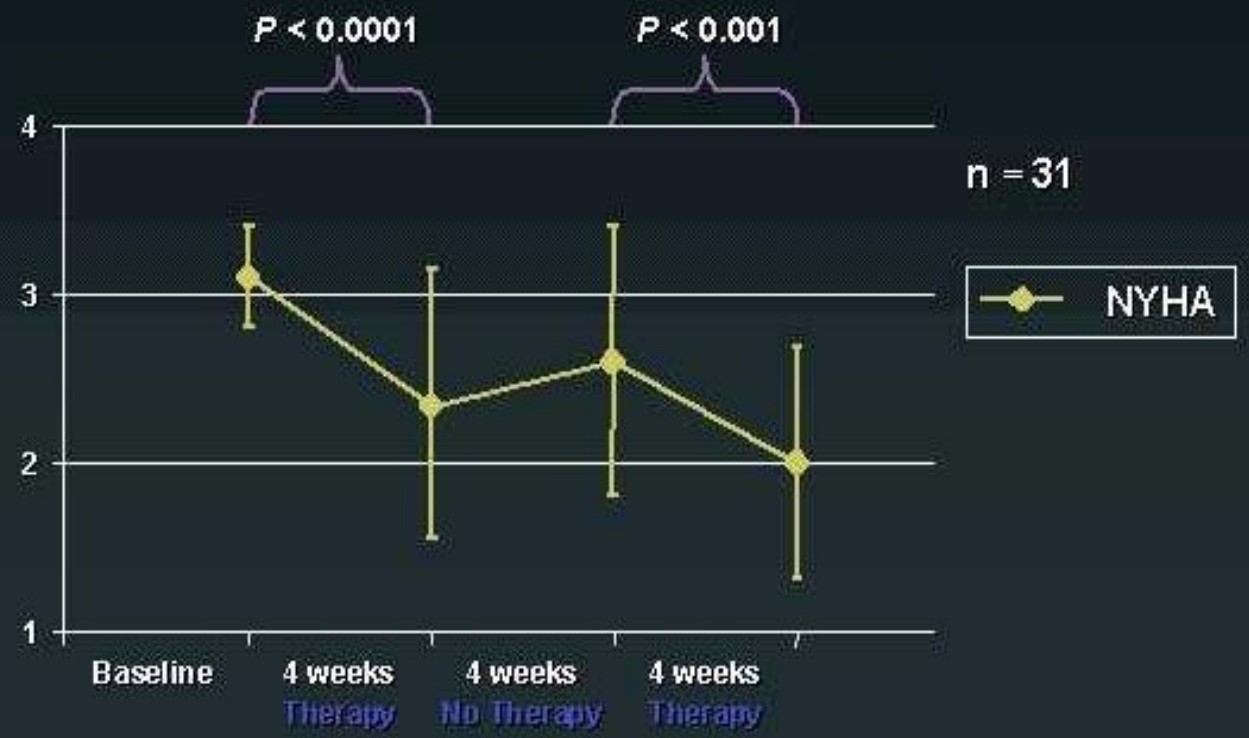
The PATH-CHF Study Results

Symptom Relief

NYHA Functional Class



Auricchio A, et al. Chronic benefit as a result of pacing in congestive heart failure: results of the PATH-CHF trial. *Journal of Cardiac Failure*. 1999;5:78.

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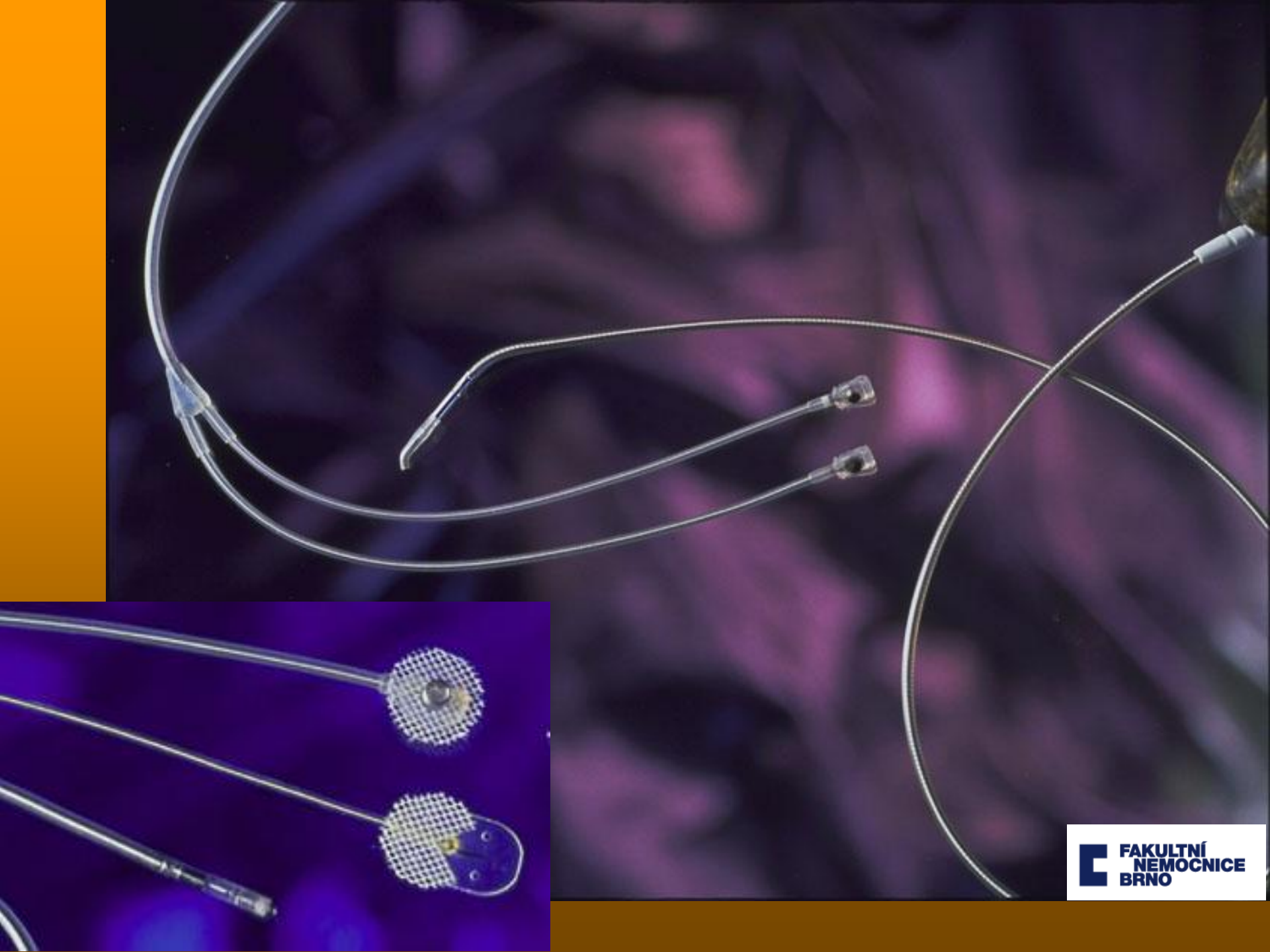
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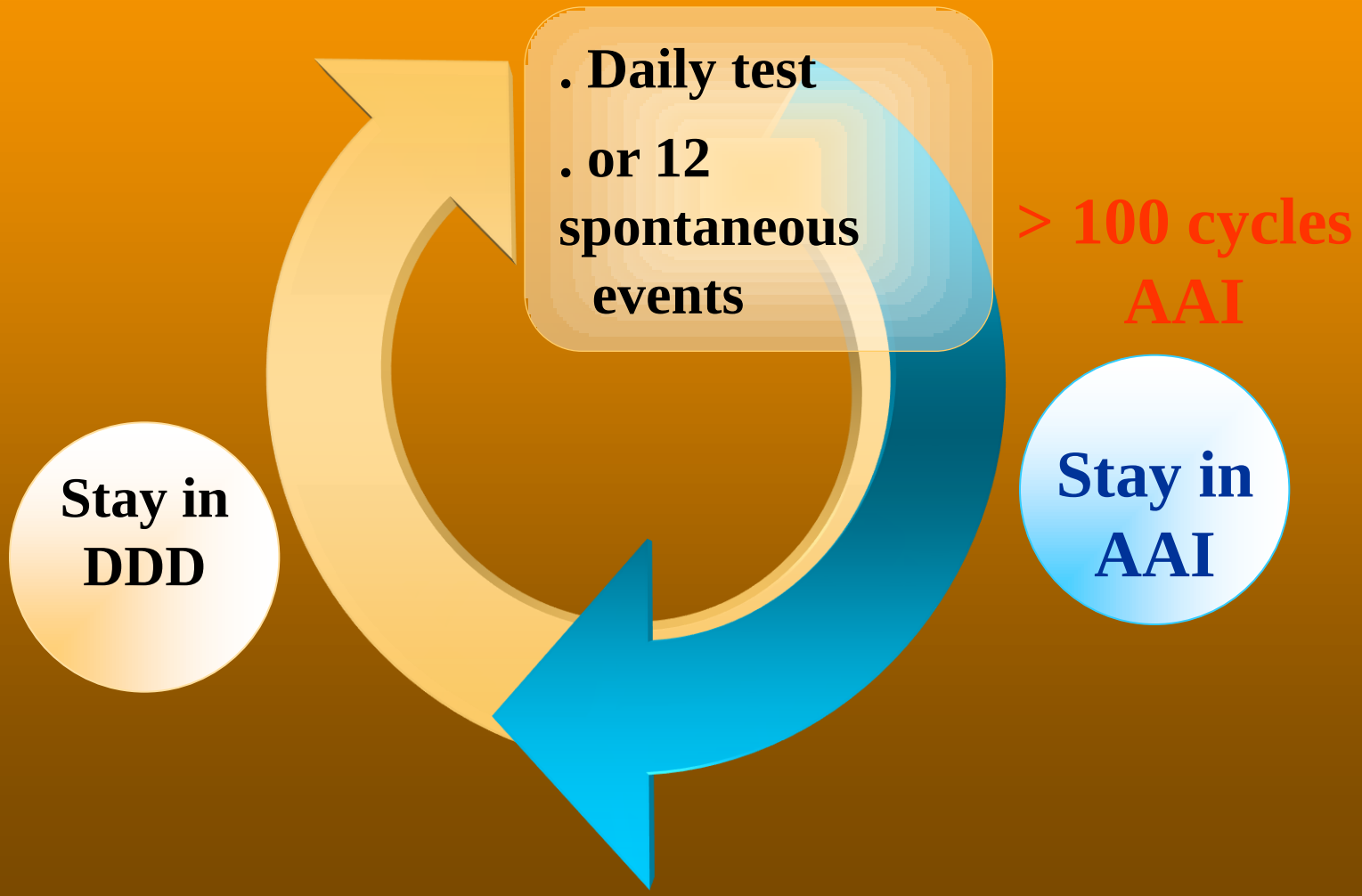
BRNO

Minimalizace komorové stimulace



Patient Look system

Conexus™
activator

ICD

- **Medtronic CareLink ®**
  (2090W)
  Programmer
- wireless

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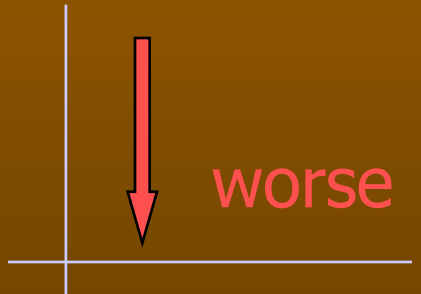
MEDTRONIC OPTIVOL ®

Lower fluid = higher transthoracal impedance

better

Higher fluid = lower transthoracal impedance



worse

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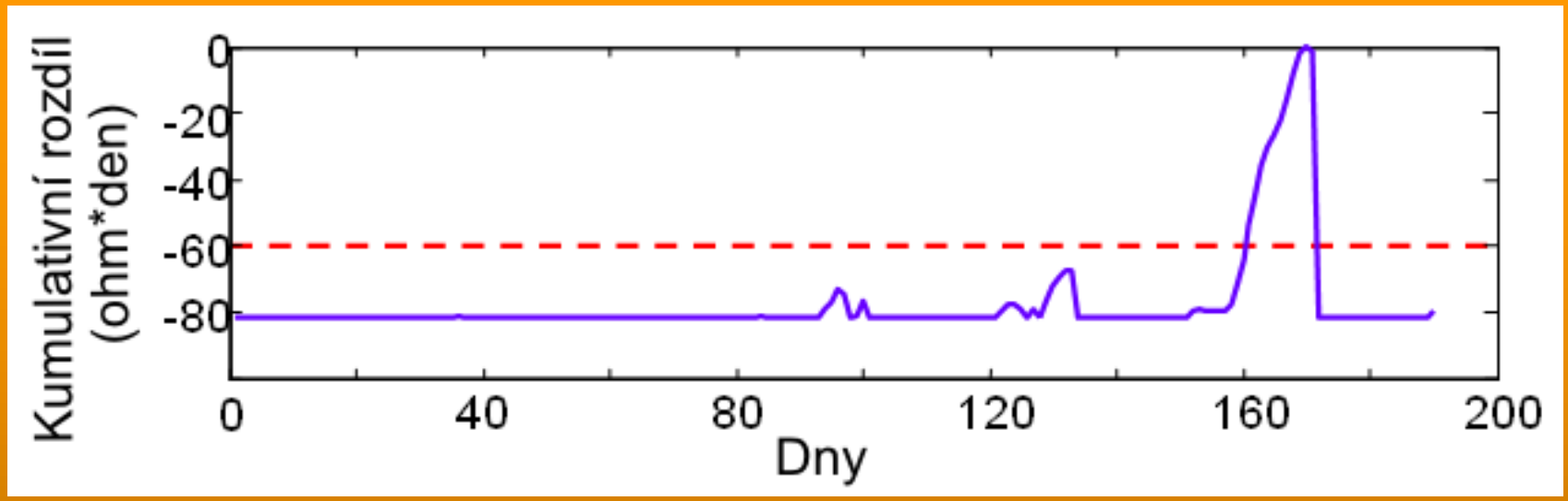

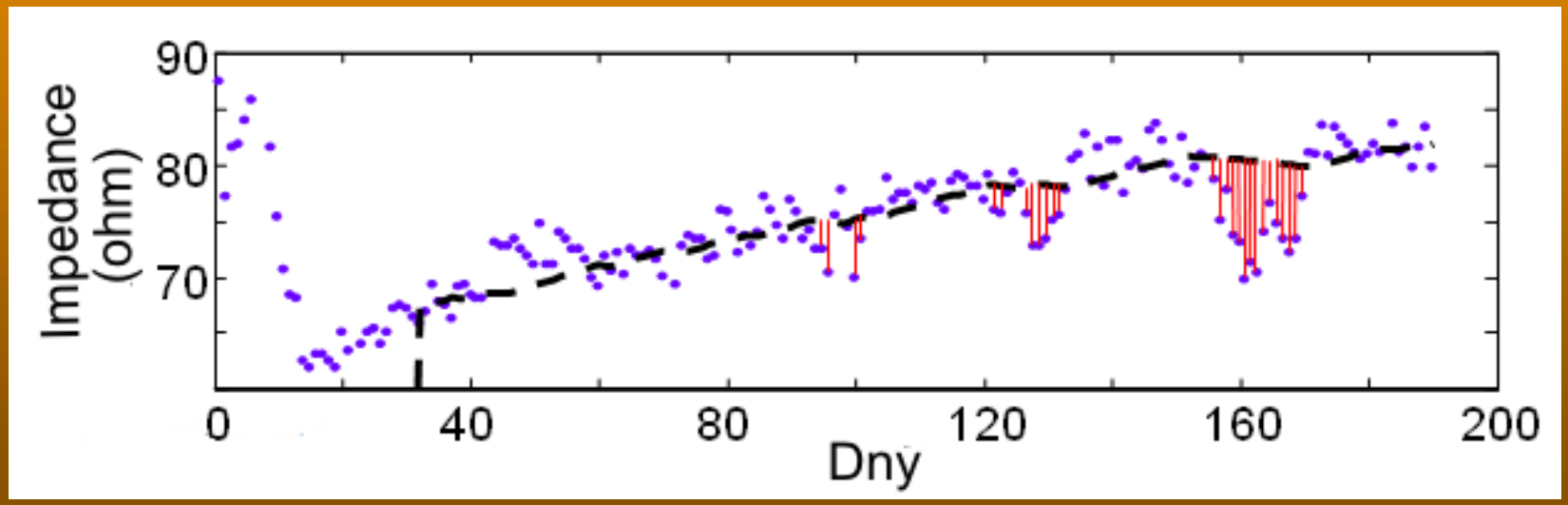

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UP TO DATE STATUS

2003 2004 2005 2006 2007 2008

BIO

Home Monitoring (‘02)

Home Monitoring II

MDT

Directo - CareLink Programmer & RemoteView

CareLink Network (’02)

CareLink Network

STJ

HouseCall

HouseCall Plus

HouseCall Plus

GDT

Renewal/Inductive/Frontier

Frontier

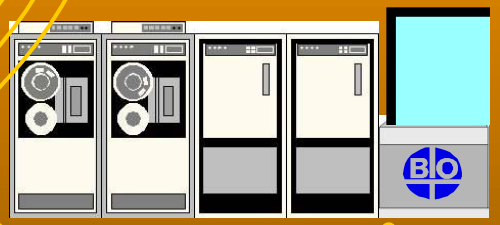
Home Monitoring

Implant with
Home Monitoring

Patient

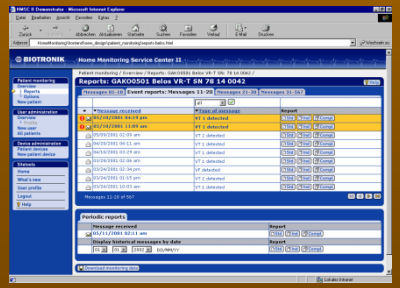
Patient Device
Cardio
Messenger

BIOTRONIK
Service Center



Cardio Report

Physician



BIOTRONIK

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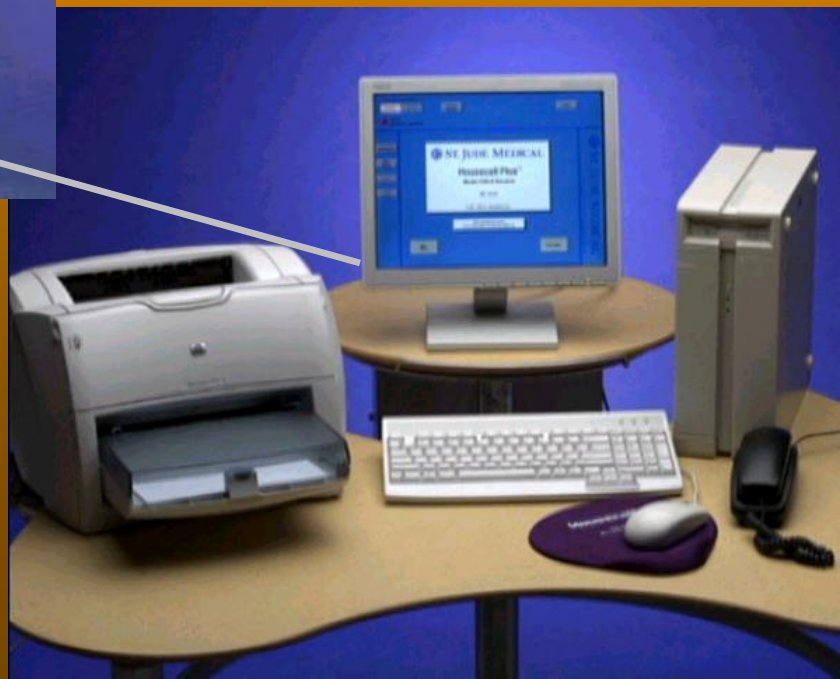
Housecall +



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CareLink and Paceart Integration

Medtronic CareLink® Monitor

Medtronic CareLink Network

Paceart® System

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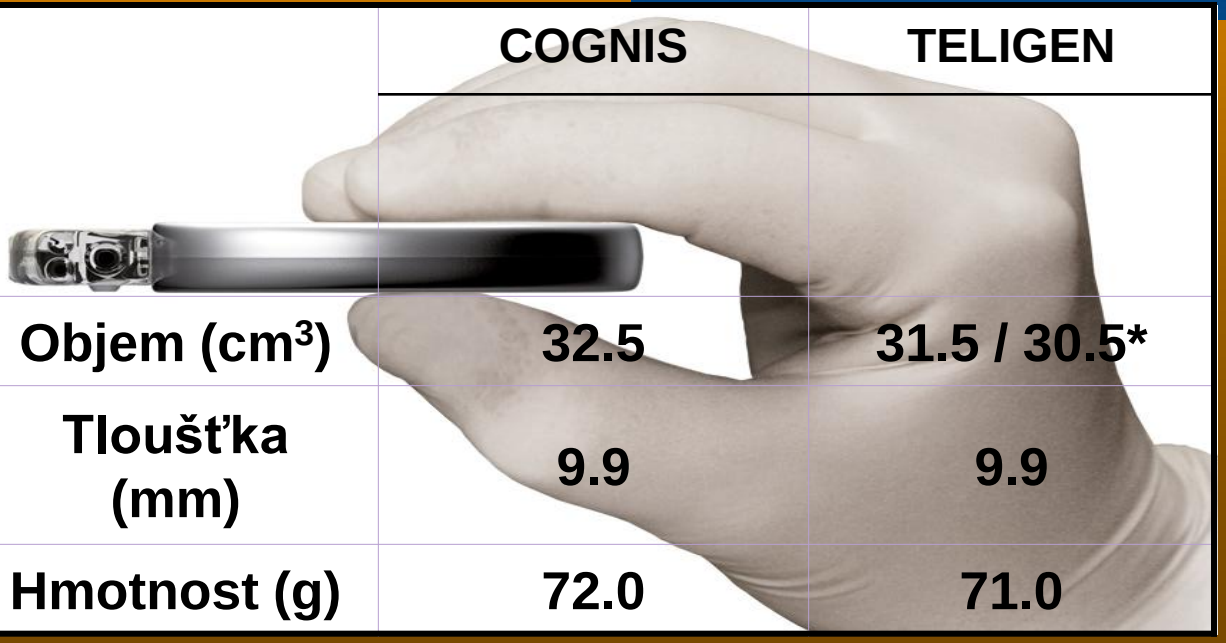
•ICD HARDWARE



	COGNIS	TELIGEN
Objem (cm^3)	32.5	31.5 / 30.5*
Tloušťka (mm)	9.9	9.9
Hmotnost (g)	72.0	71.0

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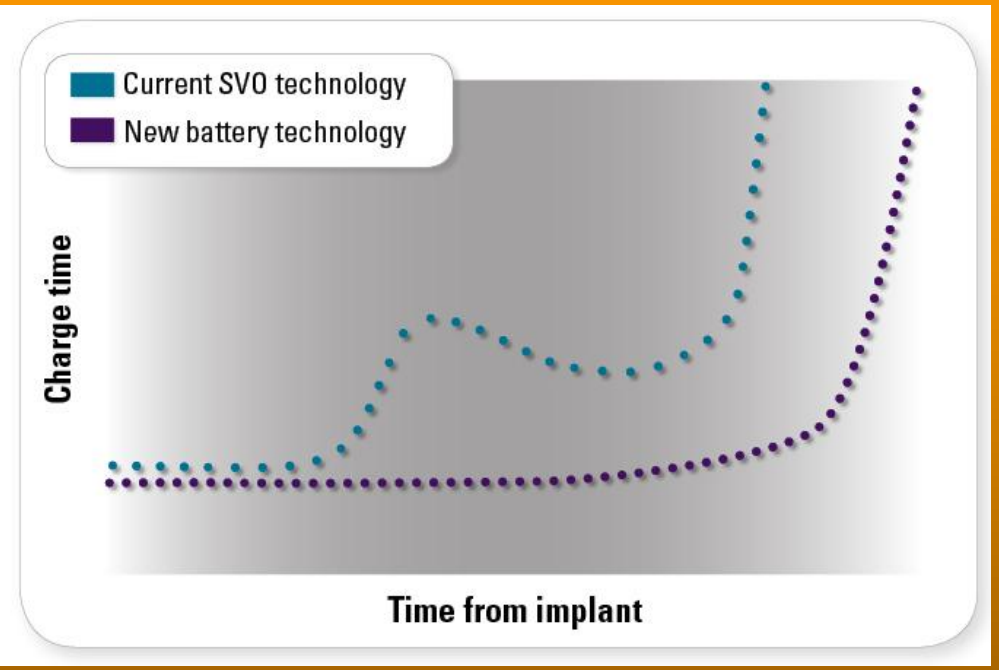
•ICD HARDWARE

•Nová technologie baterie Li/MnO2



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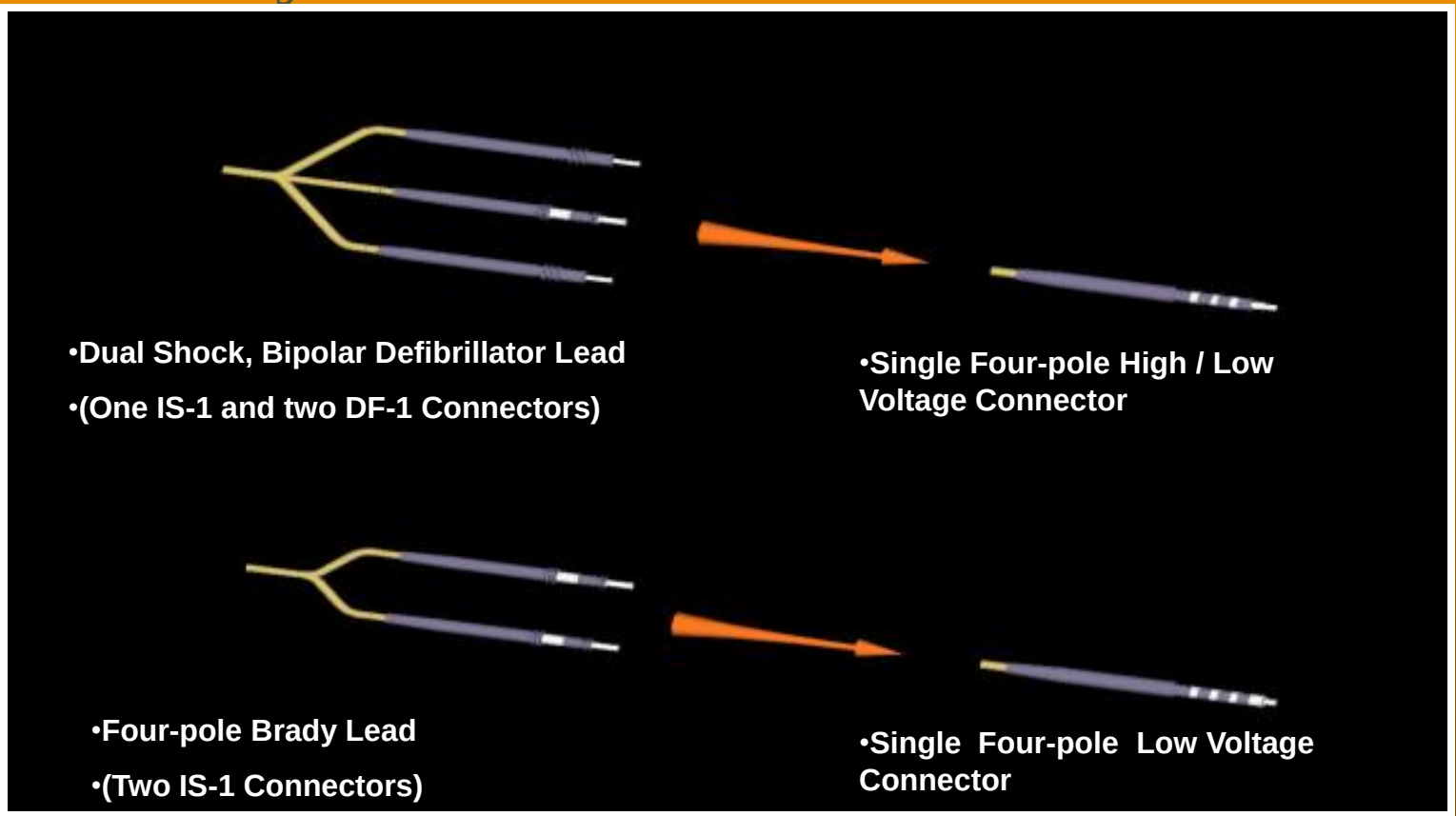
•ICD HARDWARE

Summary - Lead



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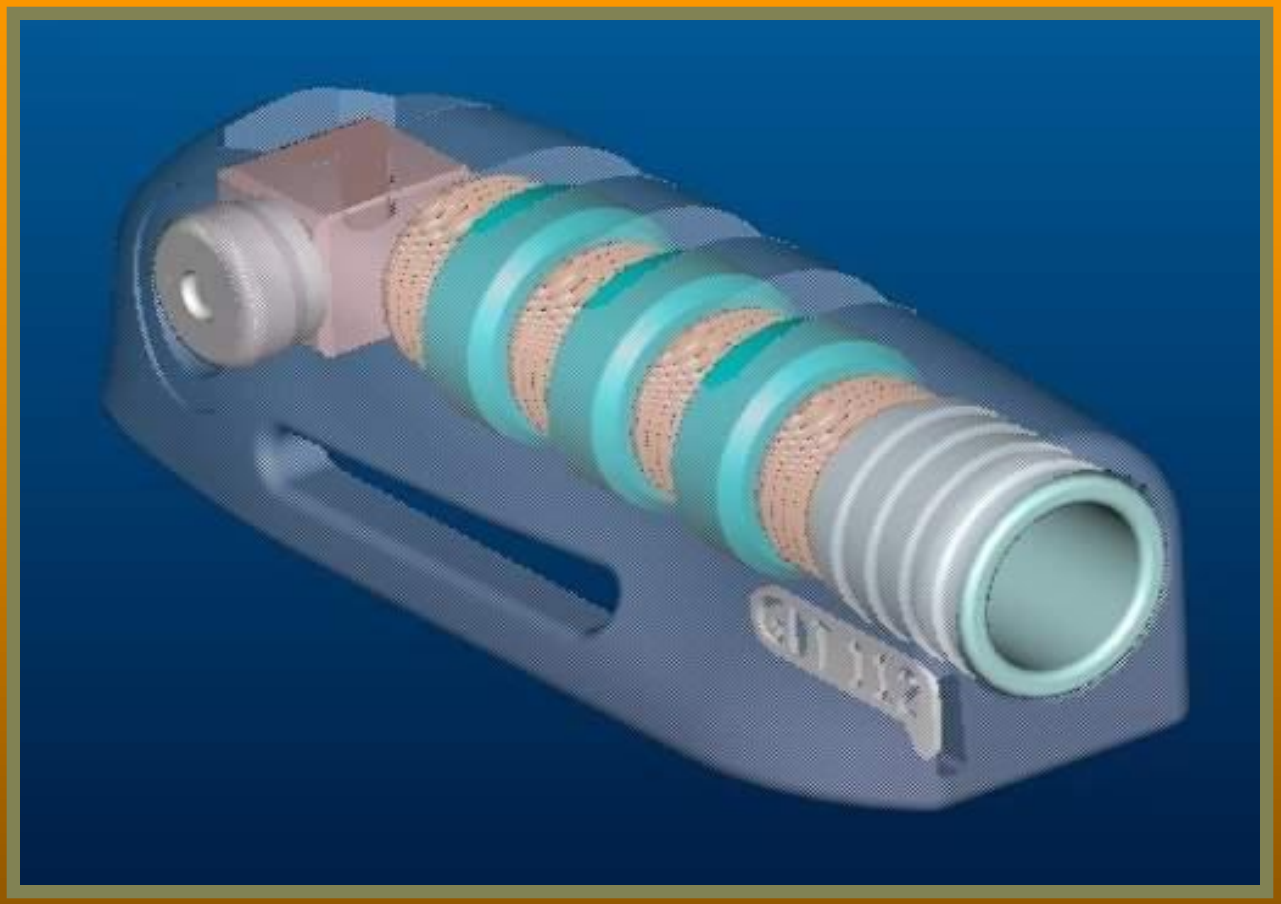
•ICD HARDWARE

IS - 4 Hlava ICD



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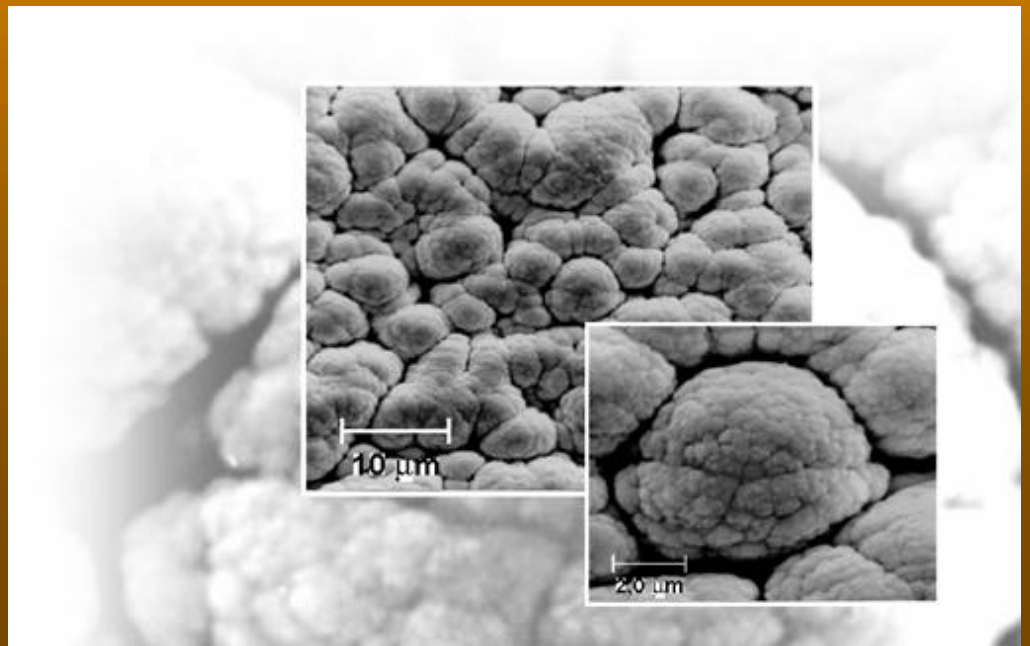
•ICD ELEKTRODY

•Mapping capabilities



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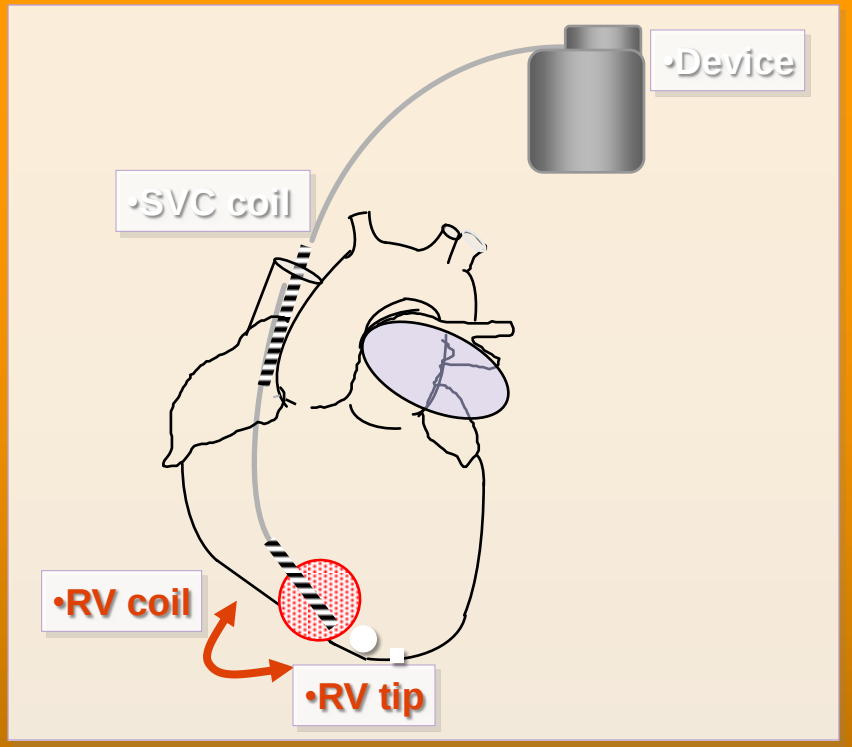
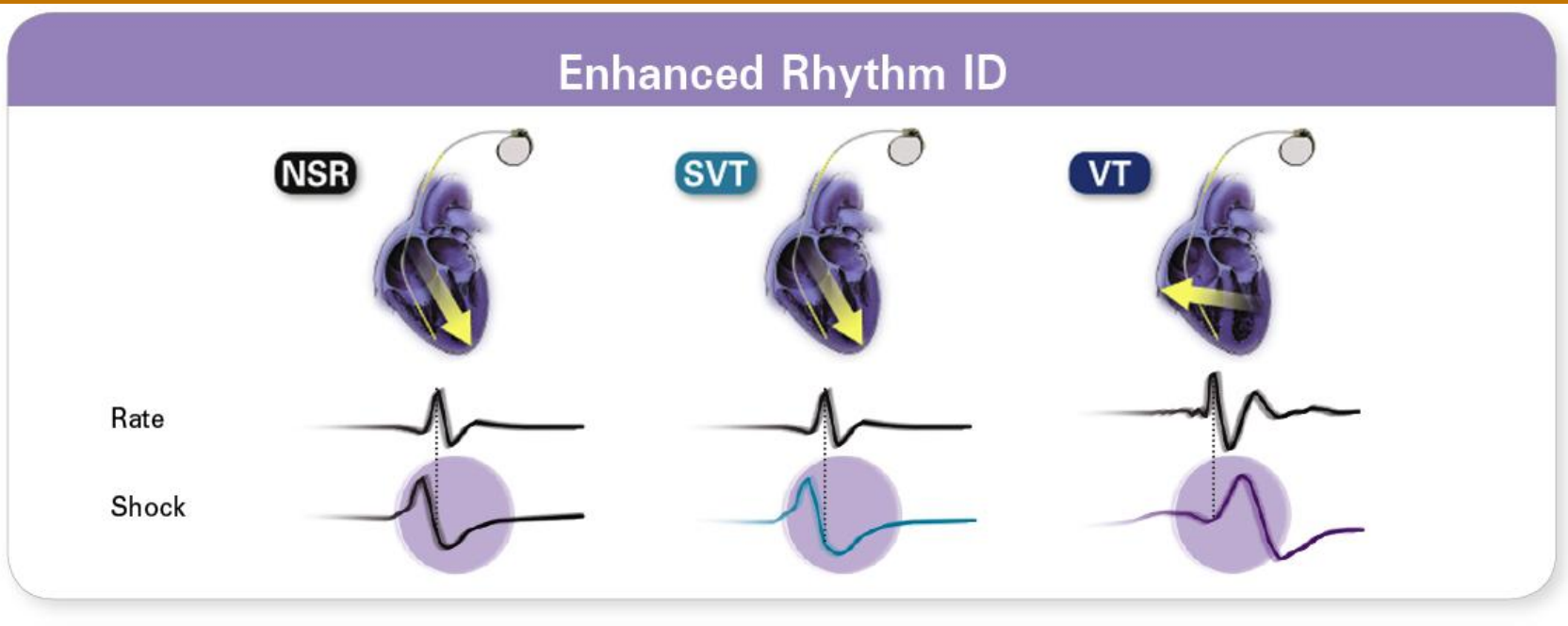
•ICD SOFTWARE

•Dynamic Noise Algorithm - D.N.A.

•ICD SOFTWARE

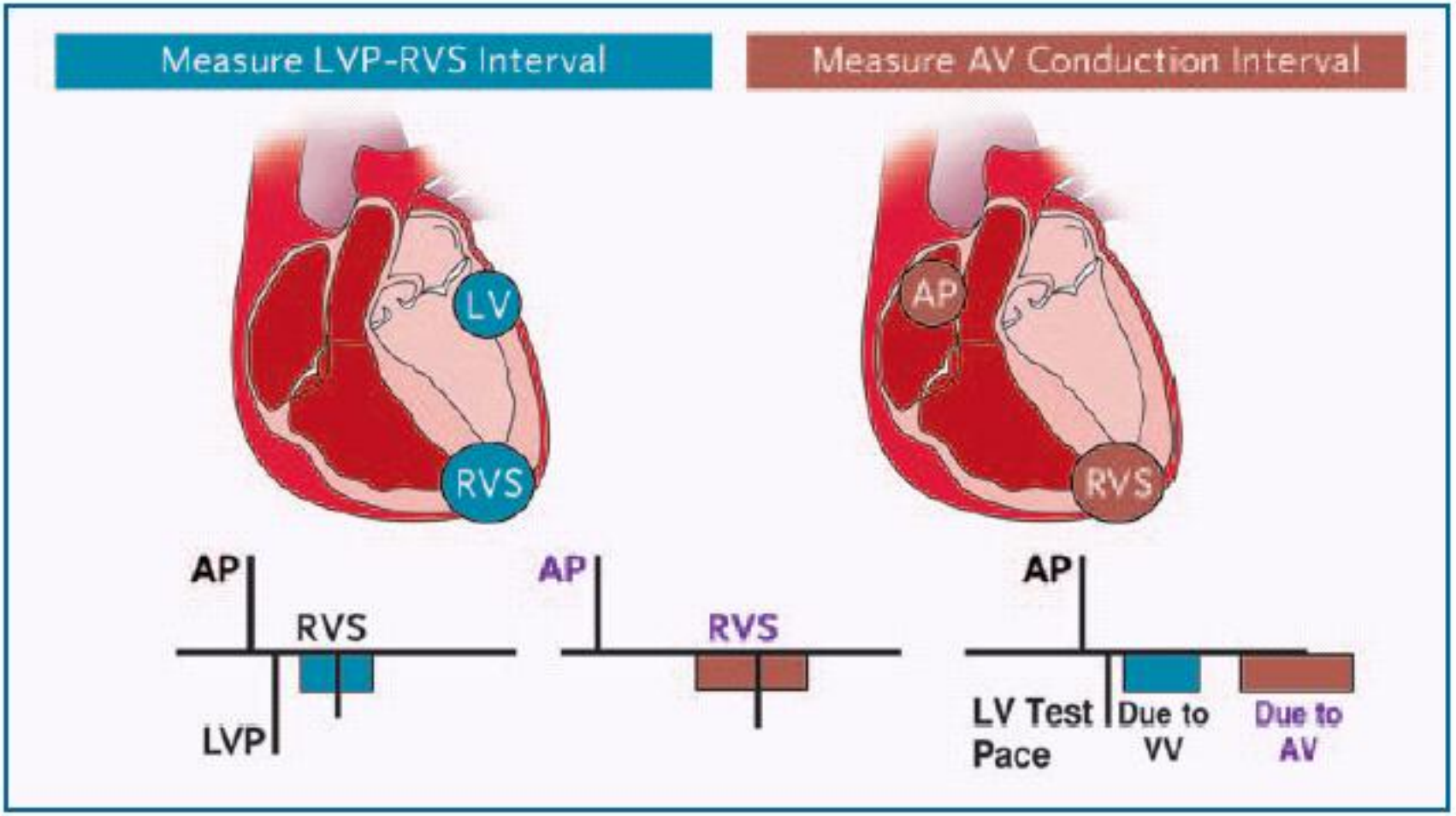




FN BRNO

•ICD SOFTWARE

•LV capture management



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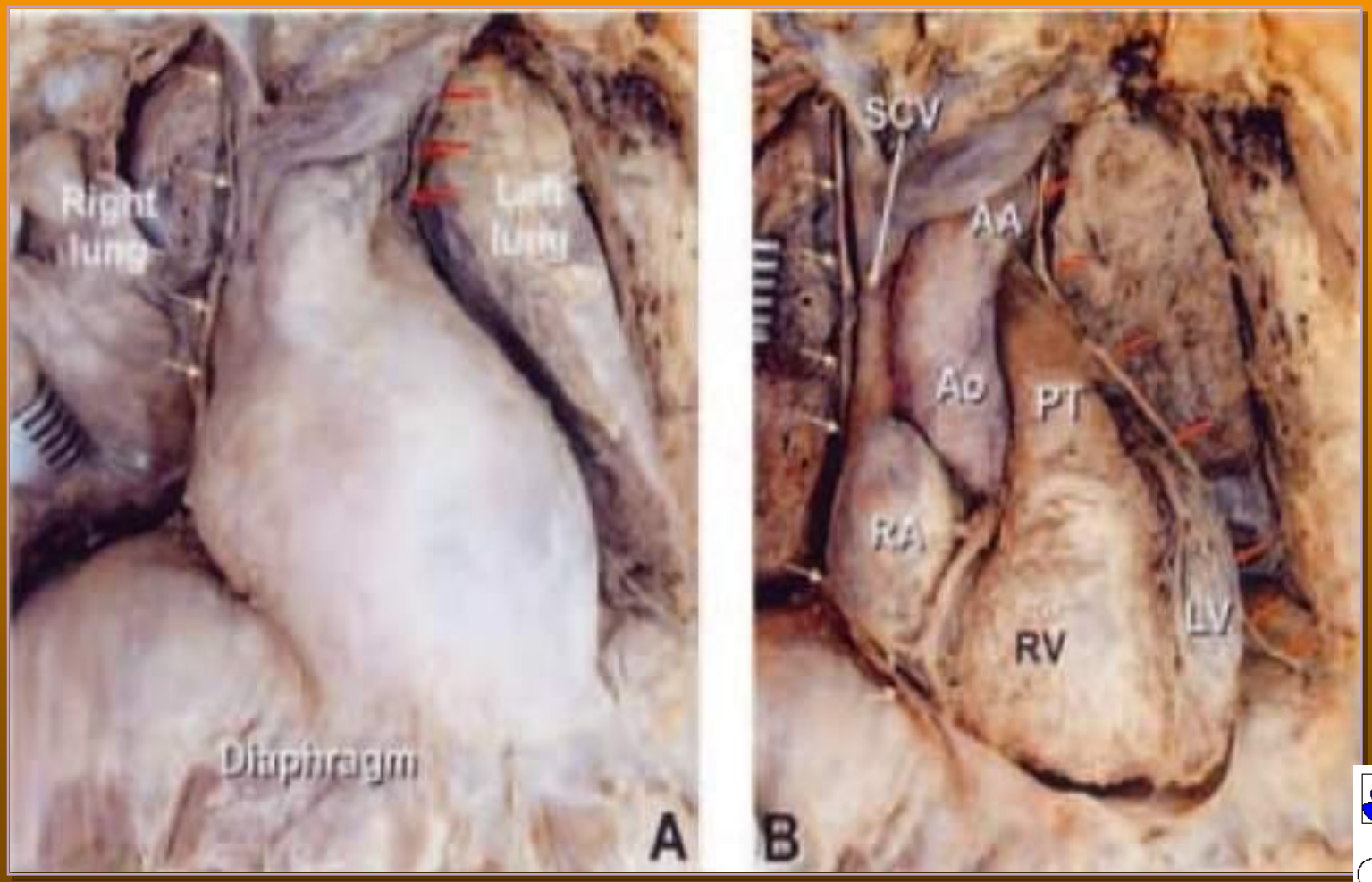
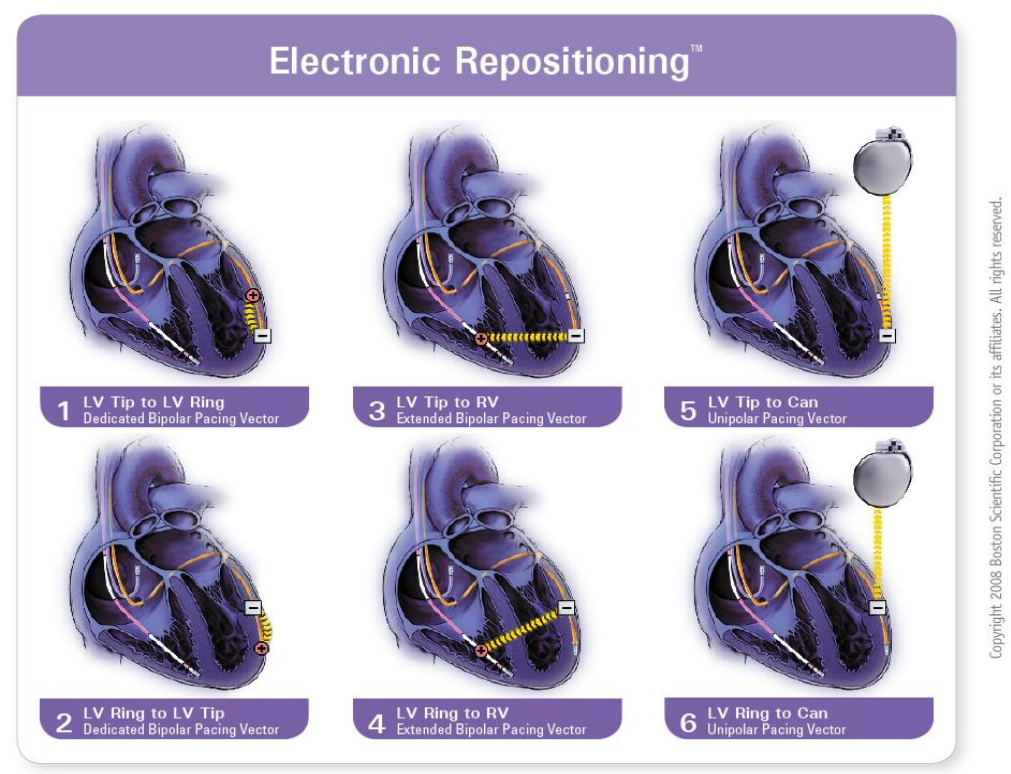
•ICD SOFTWARE

•Anatomie nervus phrenicus

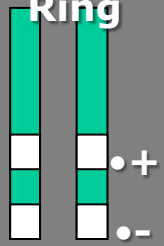


•ICD SOFTWARE

•Stimulační konfigurace v prevenci stimulace n. phrenicus

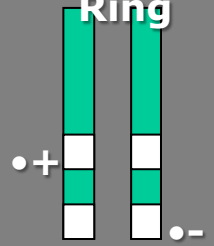


•LV-Tip → LV-Ring



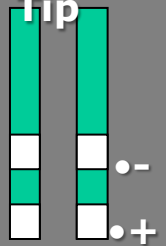
•L
V

•LV-Tip → RV-Ring



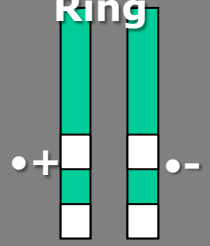
•L
V

•LV-Ring → LV-Tip



•L
V

•LV-Ring → RV-Ring



•L
V

FN BRNO

•ICD SOFTWARE

QuickOpt™
TIMING CYCLE OPTIMIZATION

OPTIMAL CRT PROGRAMMING

Change in optimal AV and V-V delay over time in the total patient cohort

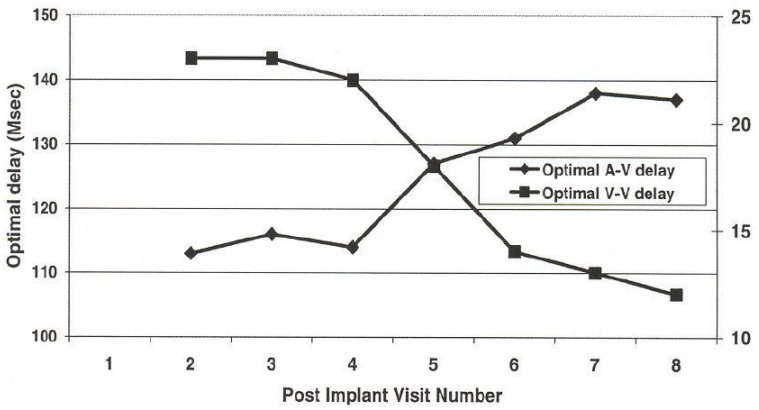
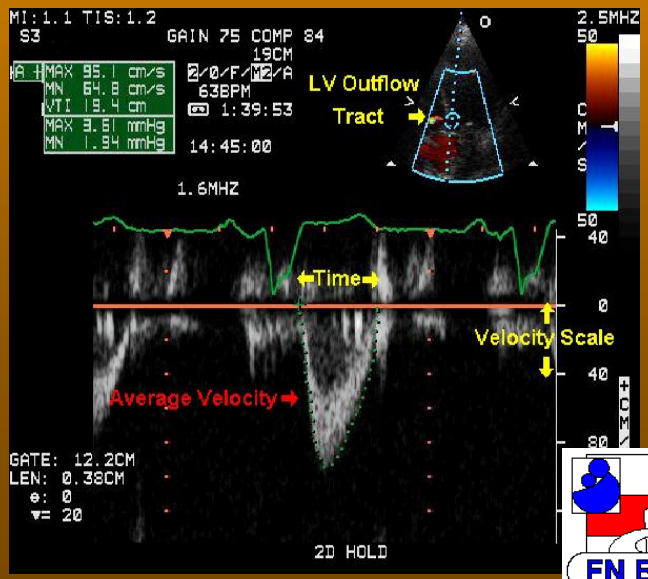


Figure 1. *Temporal variation in optimal V-V and AV delays over the eight post-implant visits in the overall patient cohort. There is a significant reduction in LV predominance of the V-V delay and a significant increase in optimal AV delay.*



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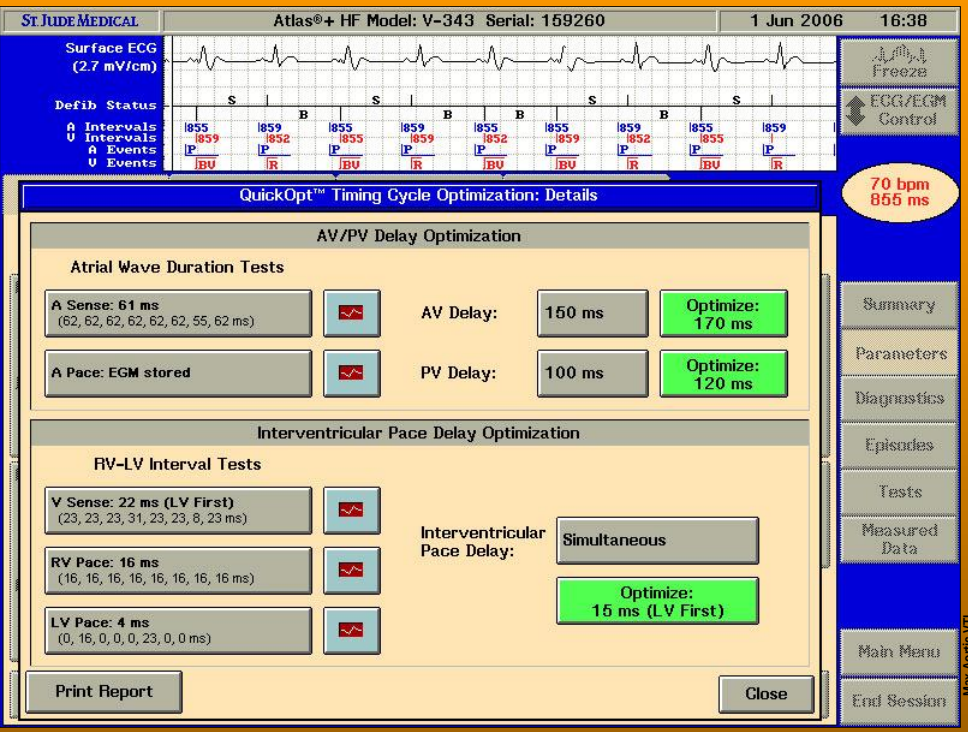
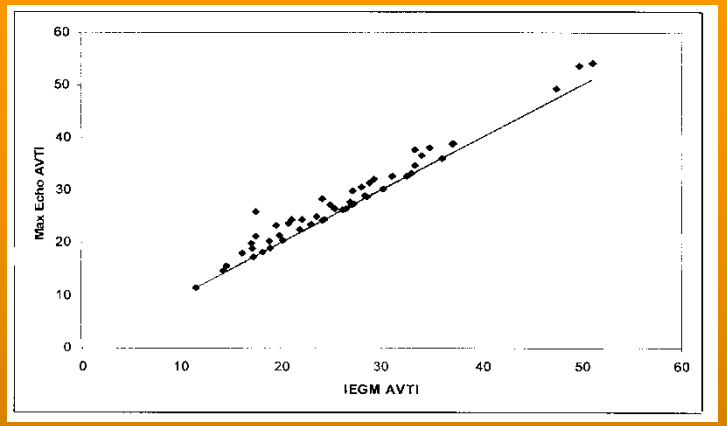
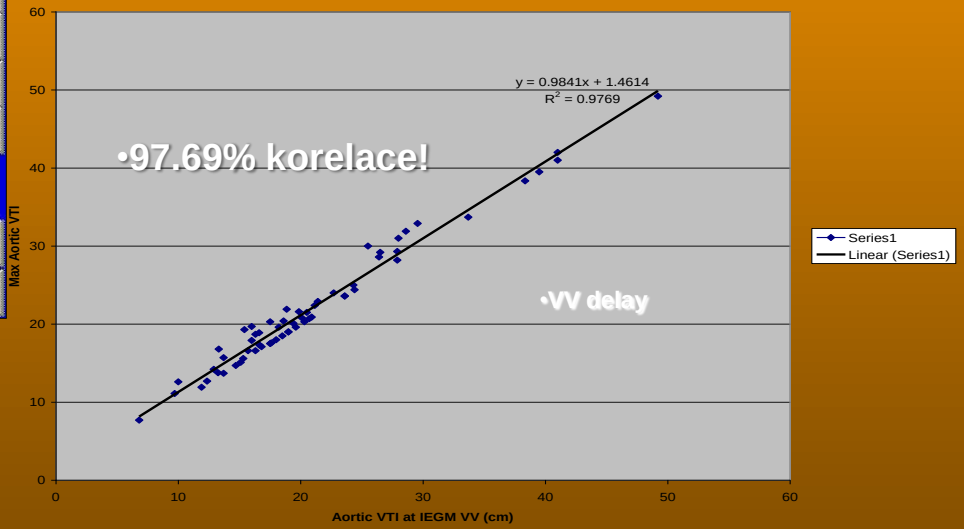
FN BRNO

•ICD SOFTWARE

QuickOpt™
TIMING CYCLE OPTIMIZATION







•Porterfield, et al. "Device based intracardiac delay optimization vs. echo in ICD patients (Acute IEGM AV/PV and VV Study)" Europace Vol 8 Supp 1 July 2006 [abstract #6178].

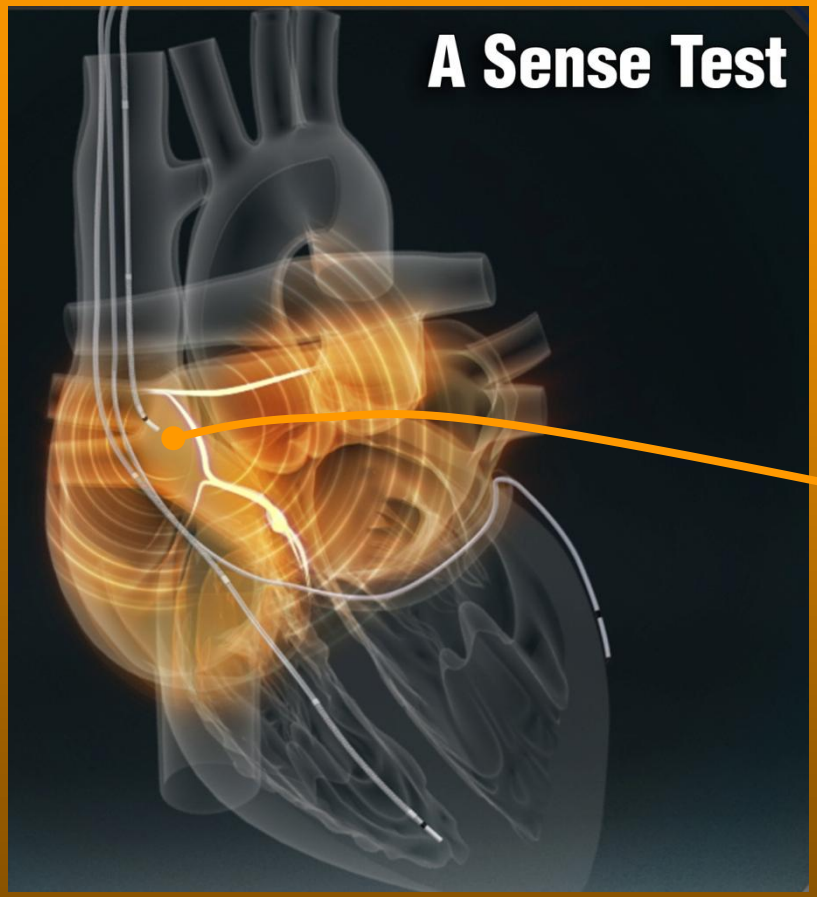
•Meine, et al. "An Intracardiac EGM Method for VV Optimization During Cardiac Resynchronization Therapy" Heart Rhythm Journal 3 (5) May 2006 [abstract AB30-5

ST. JUDE MEDICAL

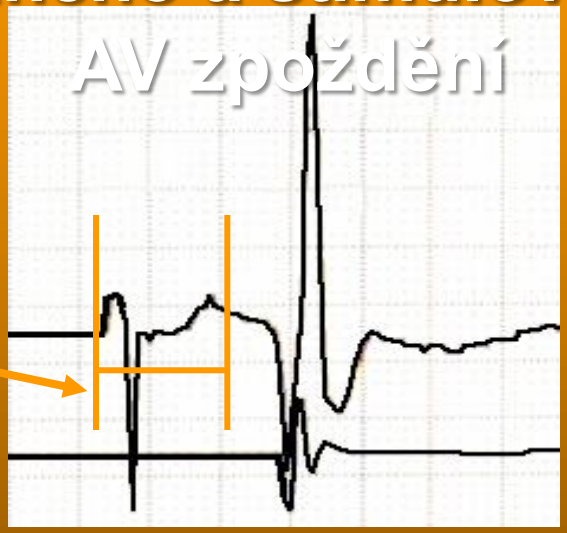
FN BRNO

•ICD SOFTWARE

QuickOpt™
TIMING CYCLE OPTIMIZATION



•Elektronická optimalizace snímaného a stimulovaného



•Trvání P vlny je odrazem aktivace PS + LS. QuickOpt™ na základě tohoto intervalu počítá optimální S/P AV zpoždění k zajištění max. preloadu a umožnění správného načasování uzávěru Mi chlopně.

•[1] Worley, et.al "Optimization of cardiac resynchronization: left atrial electrograms measured at implant eliminates the need for echo and identifies patients where AV optimization is not possible" *Journal of Cardiac Failure Aug. 2004 Vol. 10, Issue 4, Pg S62.*

ST. JUDE MEDICAL

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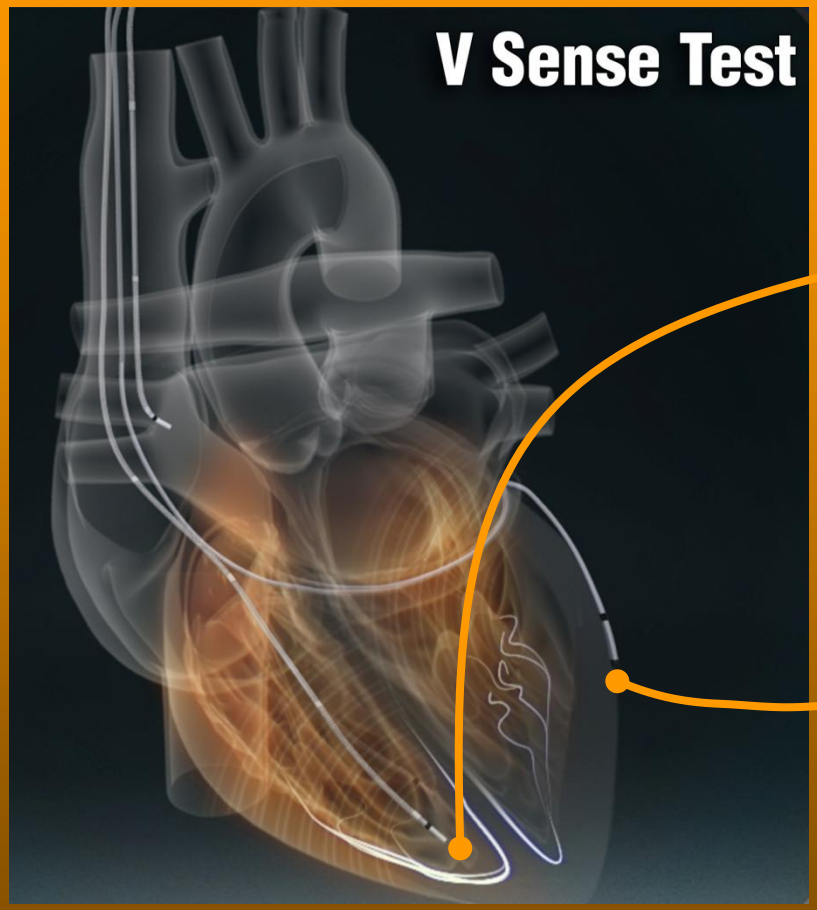
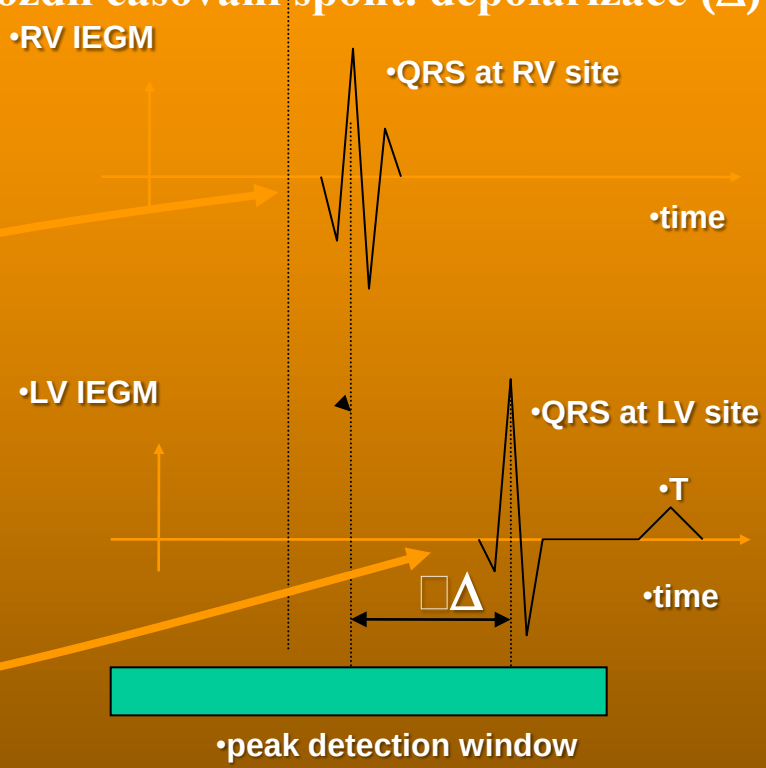
•ICD SOFTWARE

QuickOpt™
TIMING CYCLE OPTIMIZATION



V-V optimalizace:
rozdíl časování spont. depolarizace (Δ)



•Vedení v myokardu je definováno P/S testem. Cílem je aktivovat PK i LK tak, aby se stimulované elektrické aktivační vlny setkaly na IVS.

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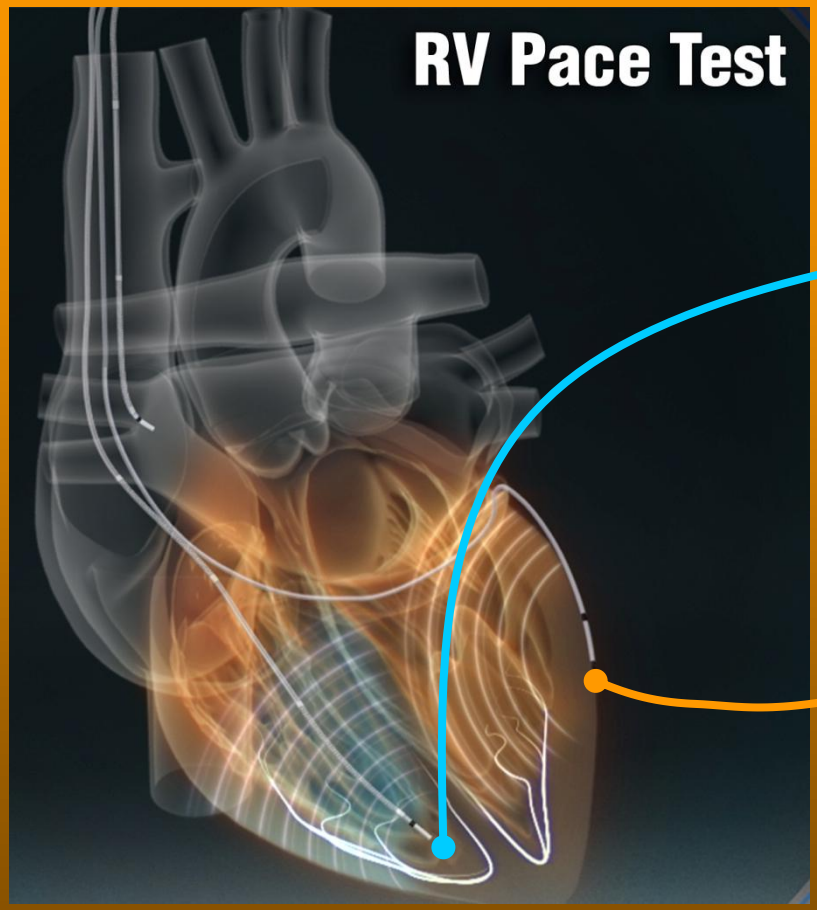
V-V optimalizace:rychlost aktivačních vln (ε)



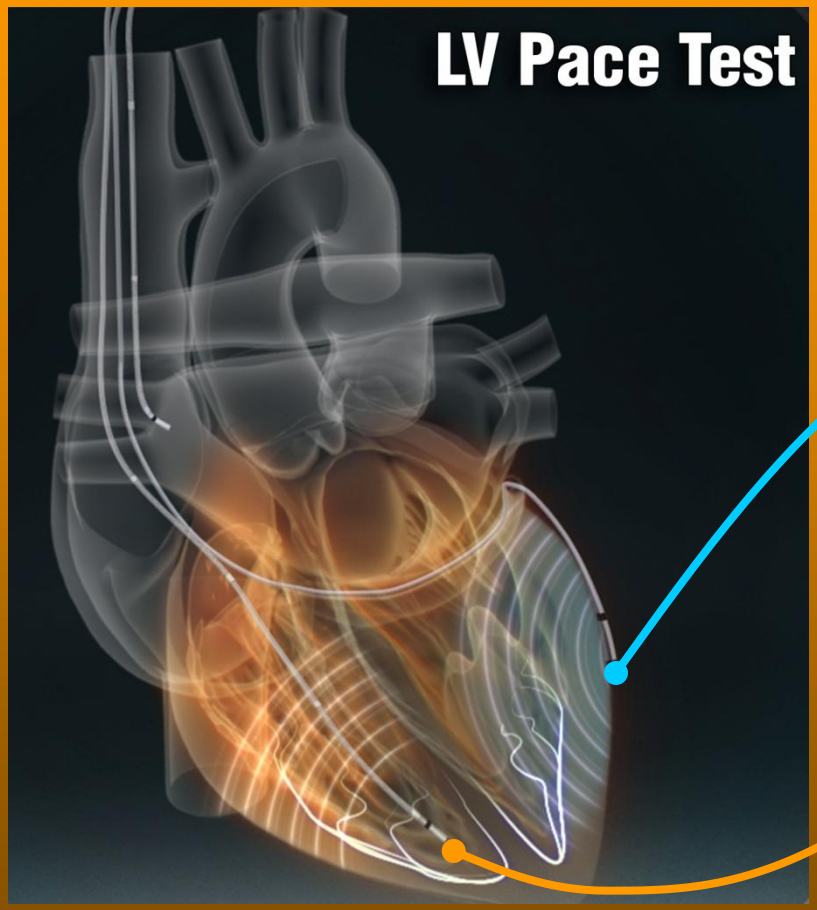
•Pacing Spike
•RV PACE
•Pace one chamber
•time
•LV IEGM
•QRS
•Sense at the other
•T
•time
•IVCD
•peak detection window

ST. JUDE MEDICAL

FN BRNO

•ICD SOFTWARE

QuickOpt™
TIMING CYCLE OPTIMIZATION

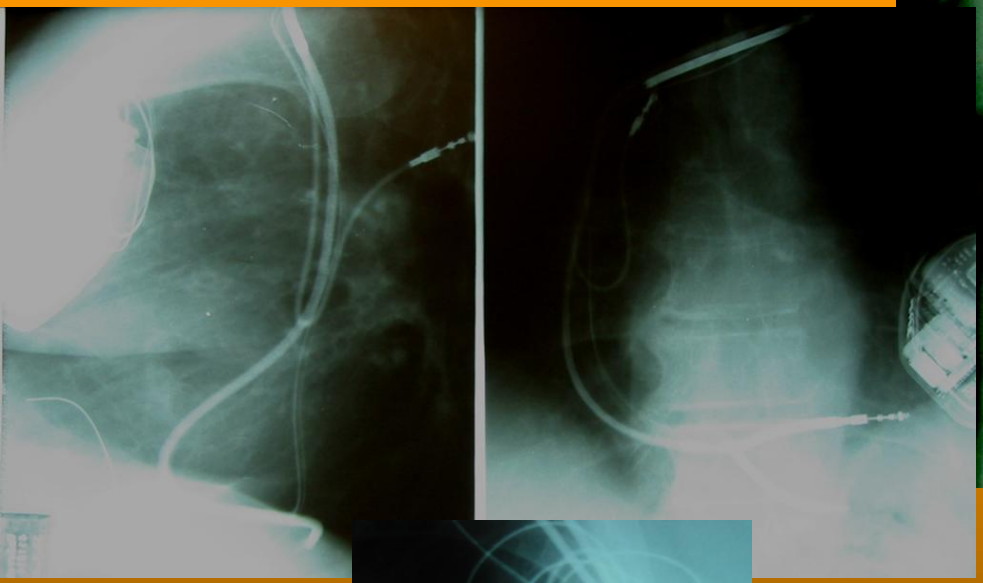


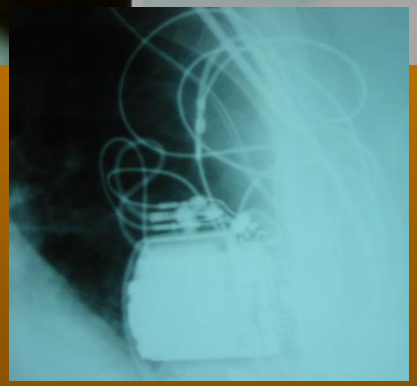
•Pacing Spike
•LV PACE
•Pace one chamber
•time
•RV IEGM
•QRS
•Sense at the other
•T
•time
•IVCD
•peak detection window

ST. JUDE MEDICAL

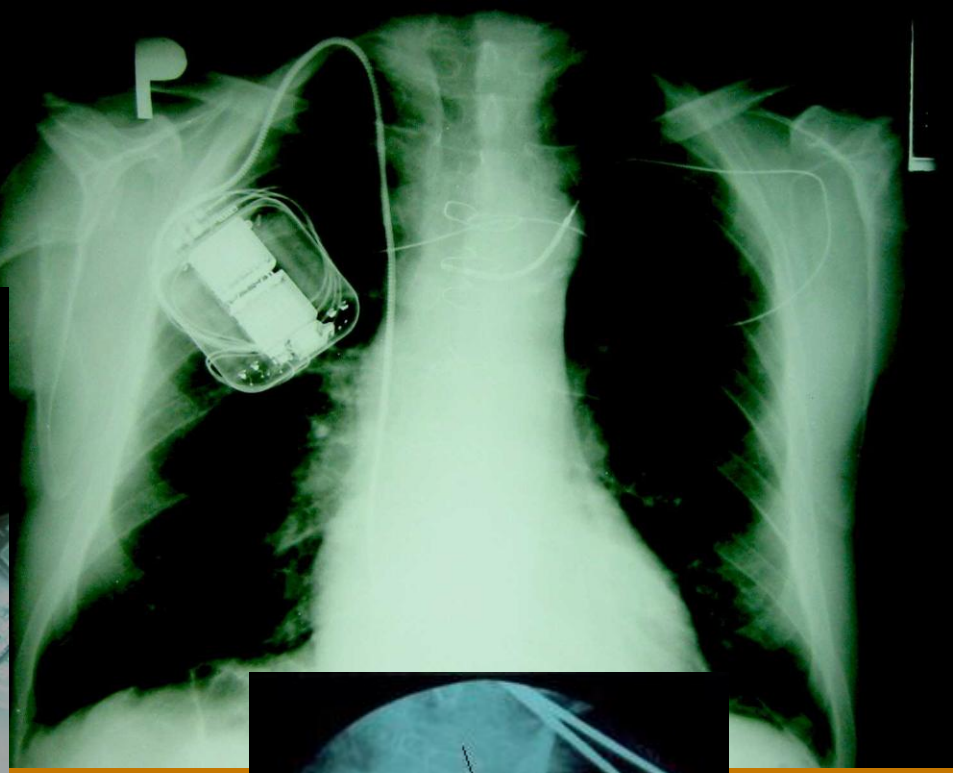
FN BRNO

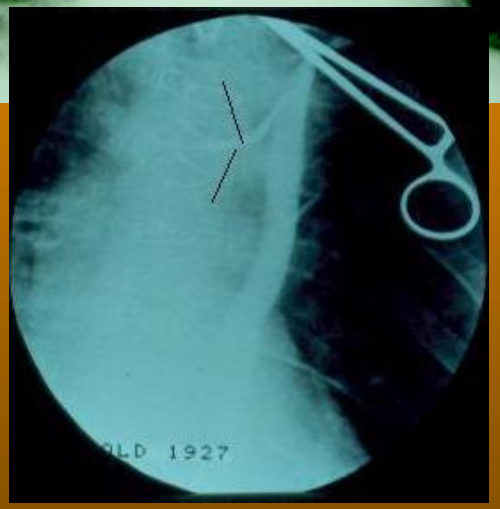
TROUBLESHOOTINGS





4 (2,9%)



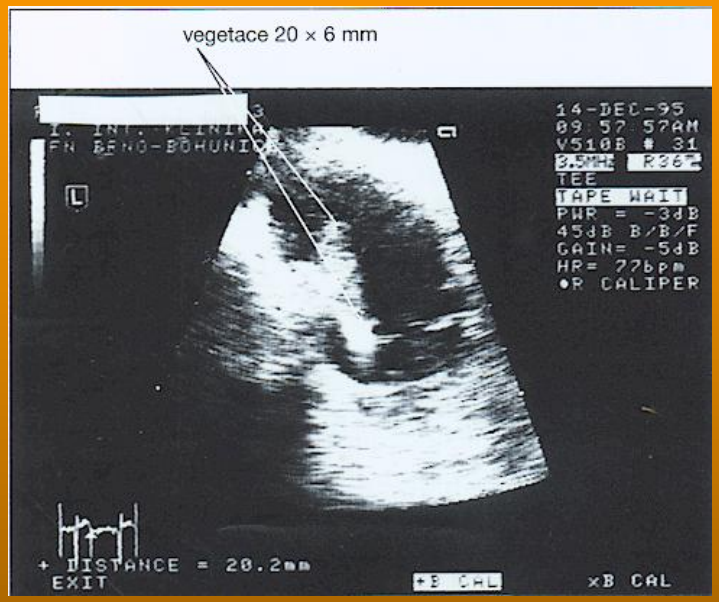


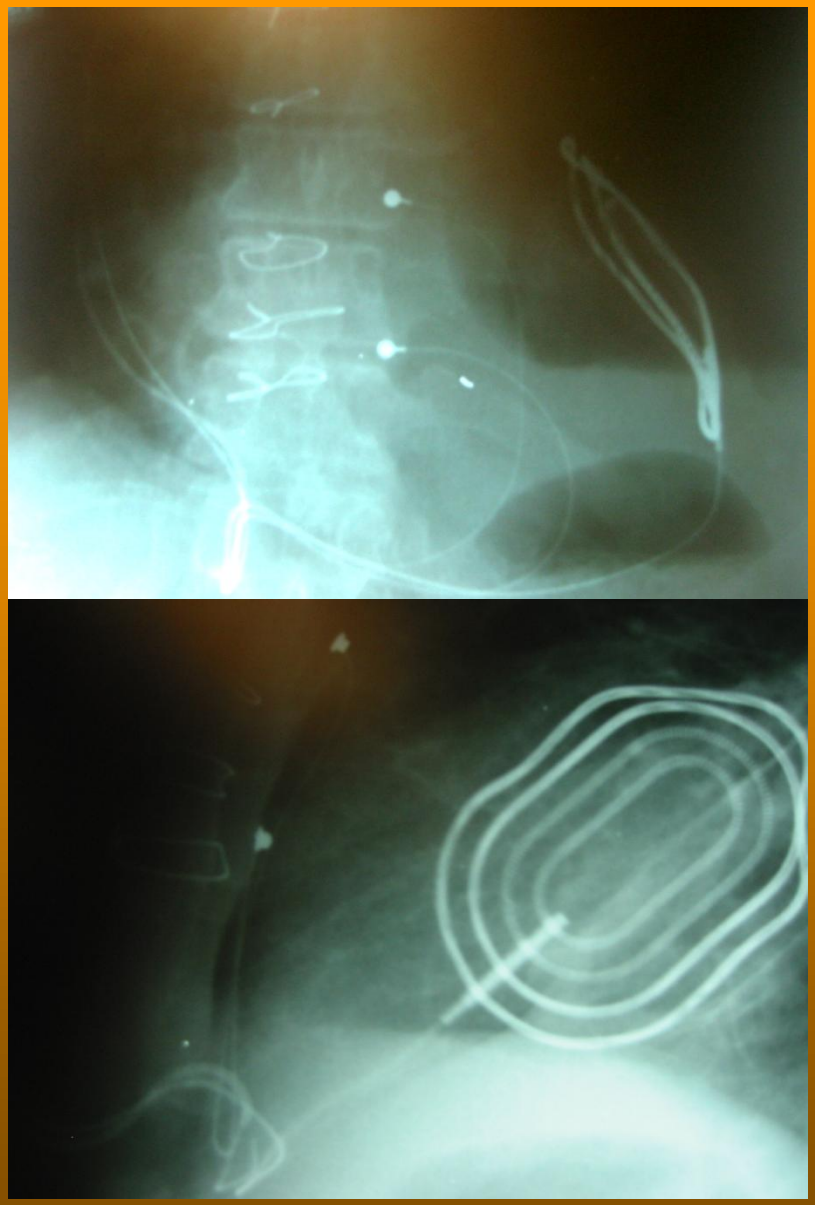
5 (3,6%)

Kozák M, Sepši M, Křivan L et al. Cardiol 2002;11(4):259-263

Kozák M, Křivan L, Semrád B et al. Cor Vasa 1999;41(5):252-254

TROUBLESHOOTINGS



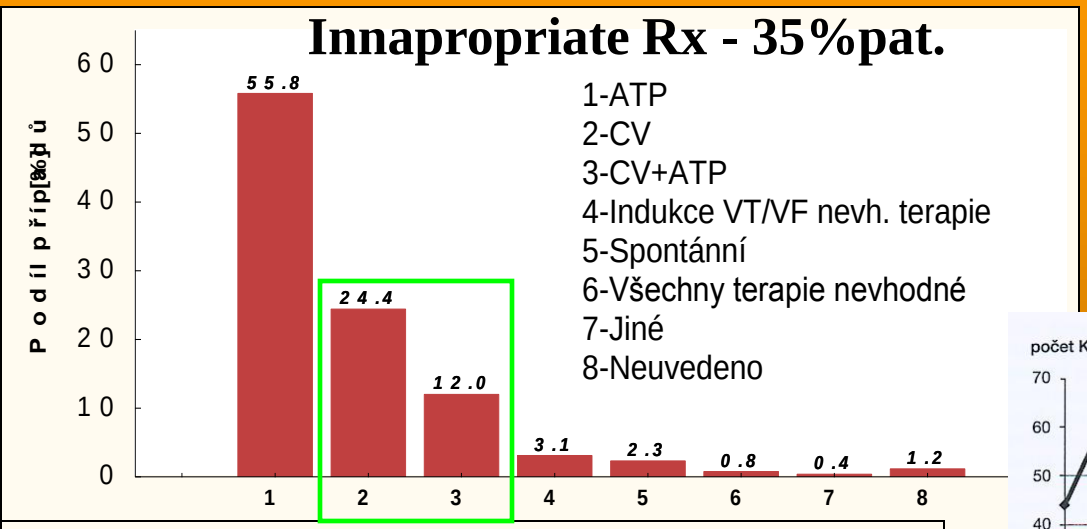


4 pac, 2x ICD kapsa, 2x IE

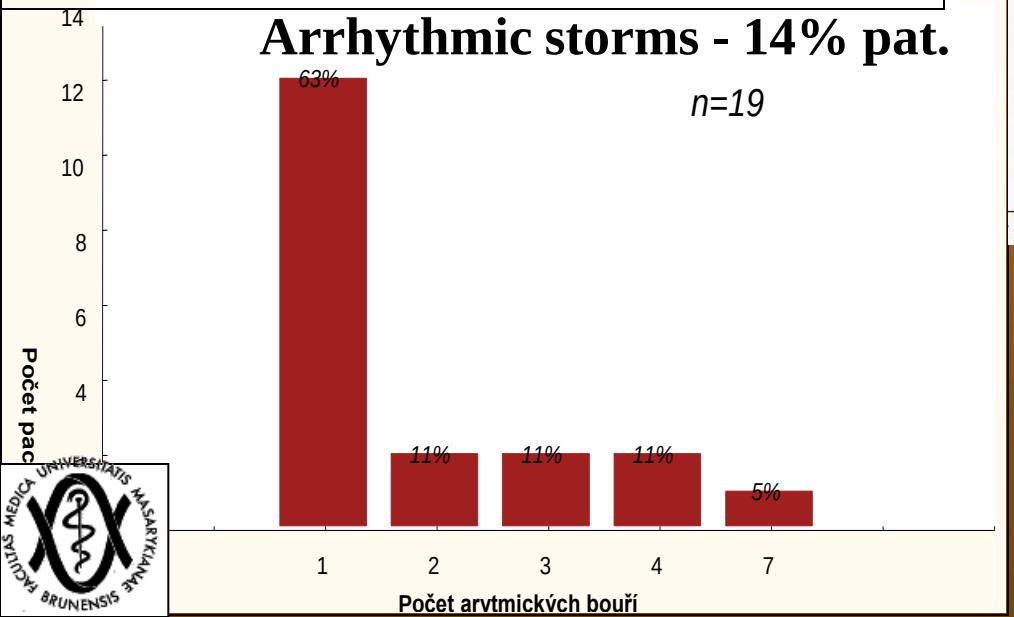
Křivan L, Kozák M, Sepši M et al. Cardiol 2001;10(5):238-242

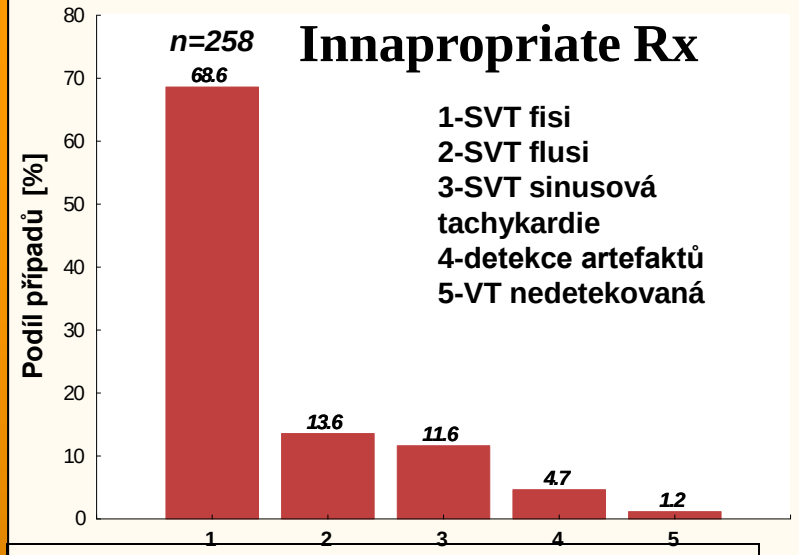
Křivan L, Kozák M, Sepši M et al. Čas Lék čes 2004;143:521-525

TROUBLESHOOTINGS

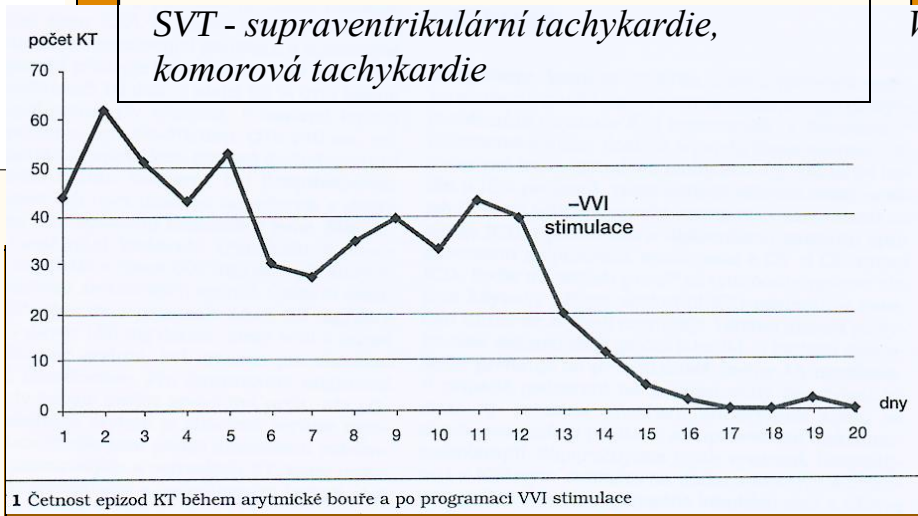


ATP - antitachykardická stimulace, CV - kardioverze





SVT - supraventrikulární tachykardie, komorová tachykardie

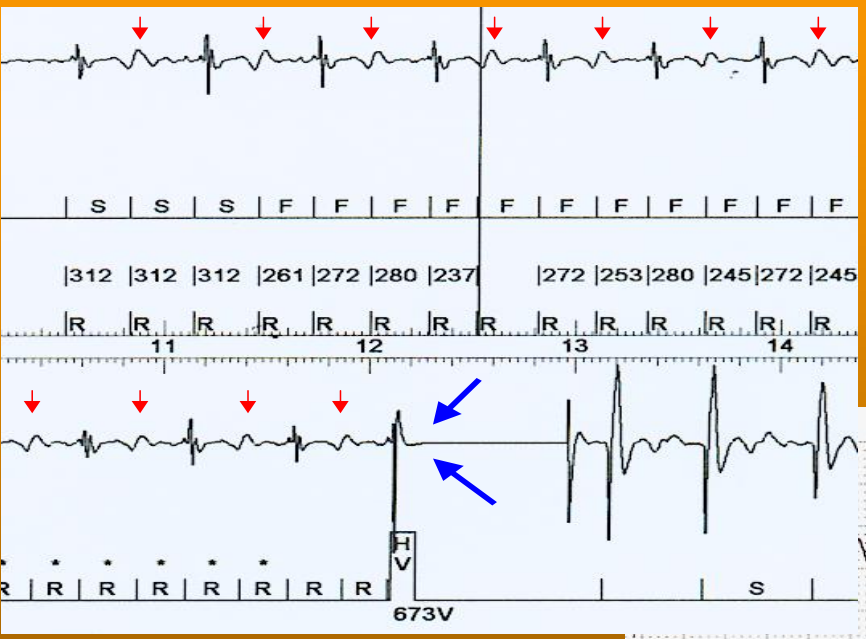


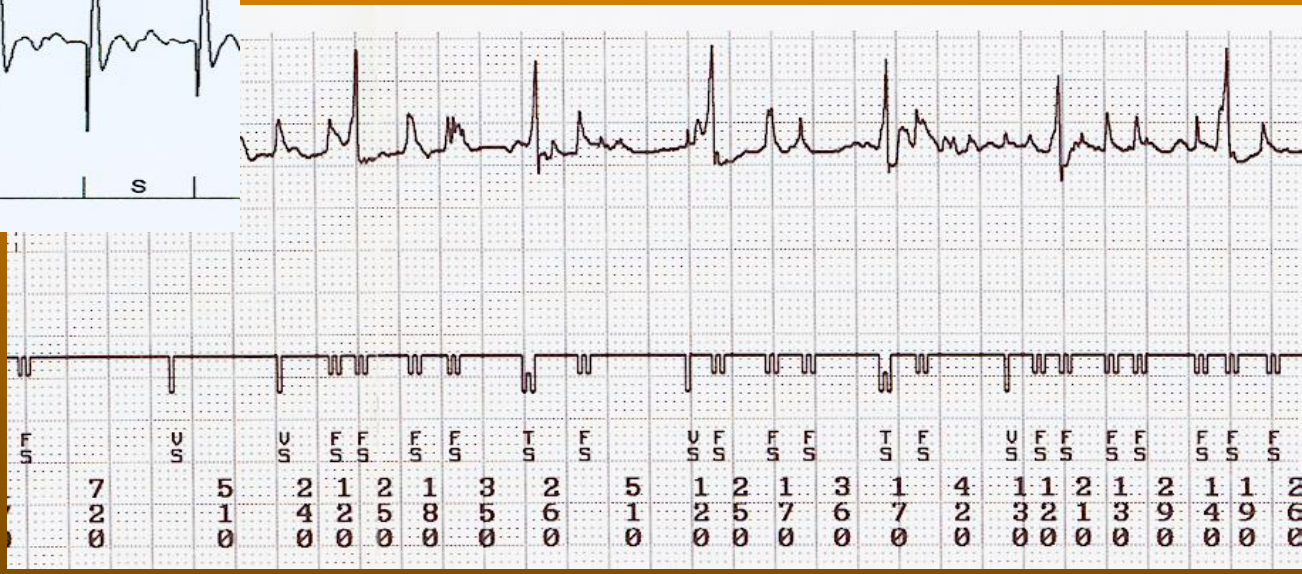
1 Četnost epizod KT během arytmické bouře a po programaci VVI stimulace

Křivan L, Kozák M, Vlašínová J et al., Cor Vasa 1999;41(2):112-115

Křivan L, Kozák M, Sepši M et al., Med Sci Monit 2005;11(9):CR426-429

TROUBLESHOOTINGS

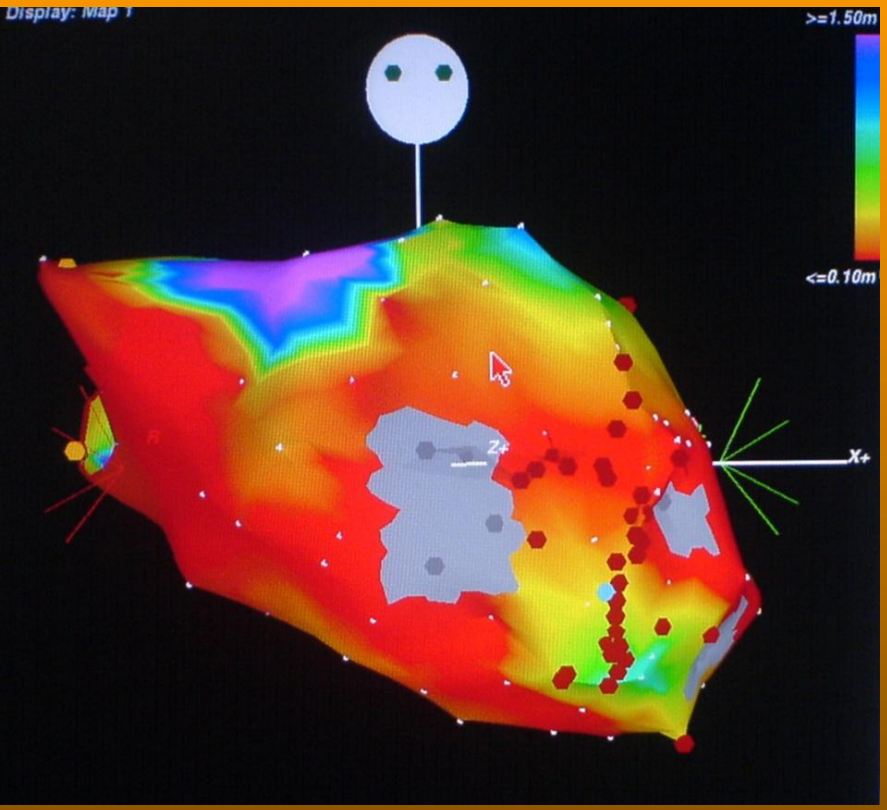


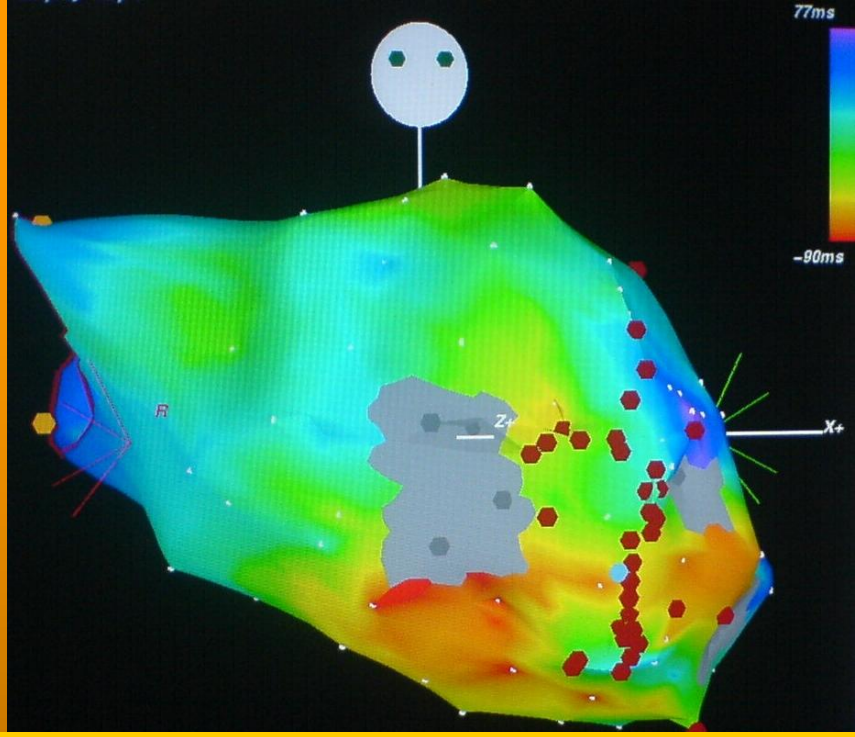


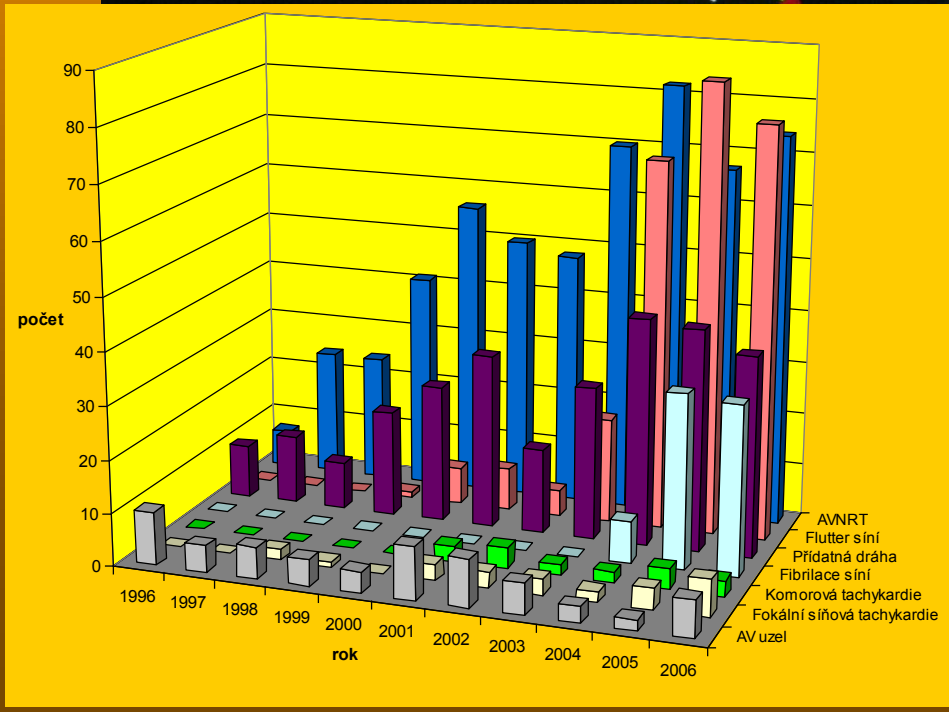
Křivan L, Kozák M, Semrád B. Cardiol 1999;8(2):59-64

Křivan L, Kozák M, Sepši M et al. Čas Lék čes 2004;143:521-525

RFA VT







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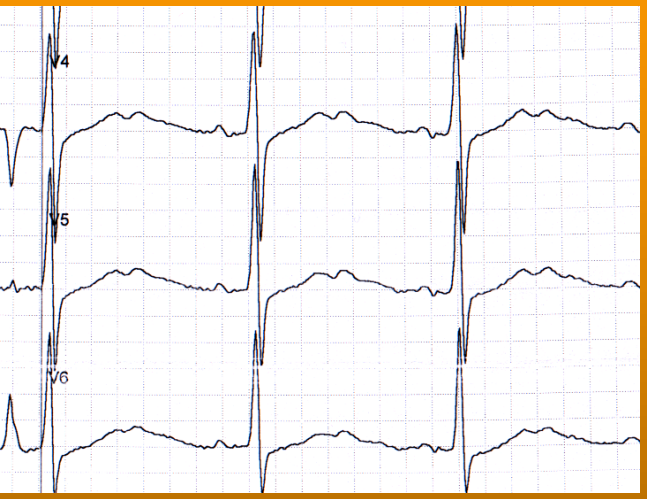
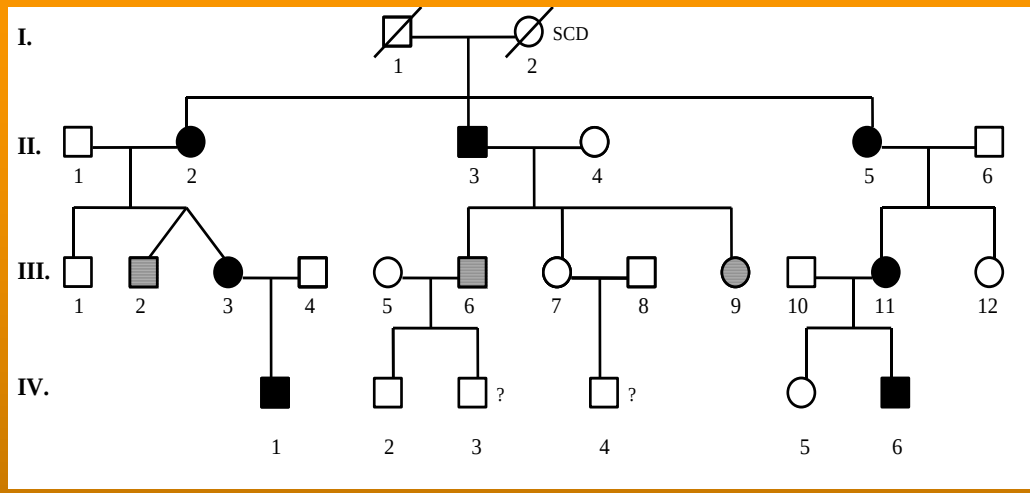
PREVENTIVE PROGRAMMS

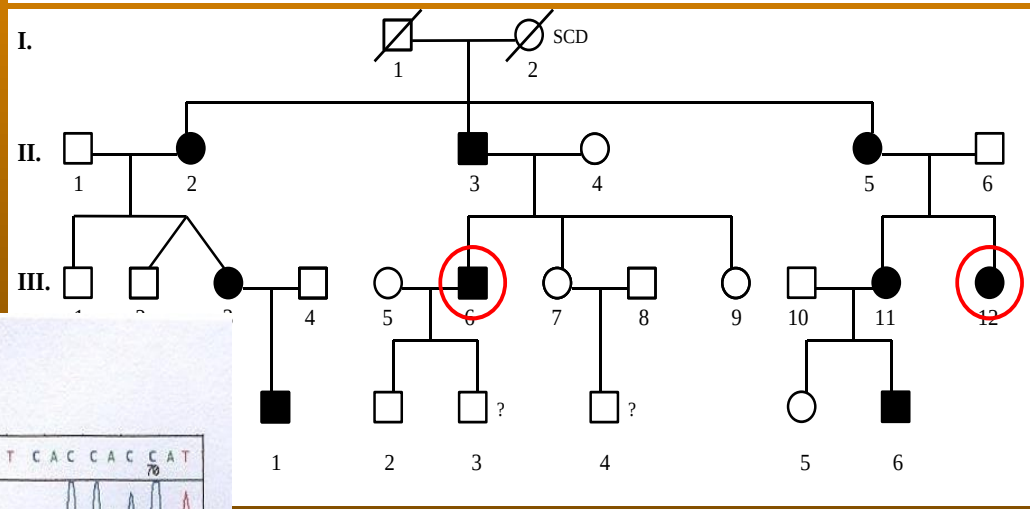
LQTsy

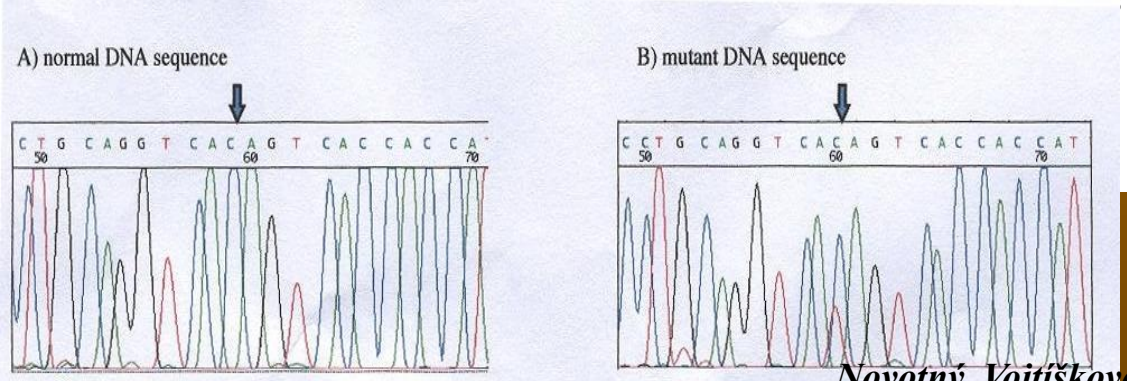
FENOTYPE





GENOTYPE





Novotný, Vojtíšková, Semrád, et al. Cor Vasa 2000;42:260-2

FN BRNO