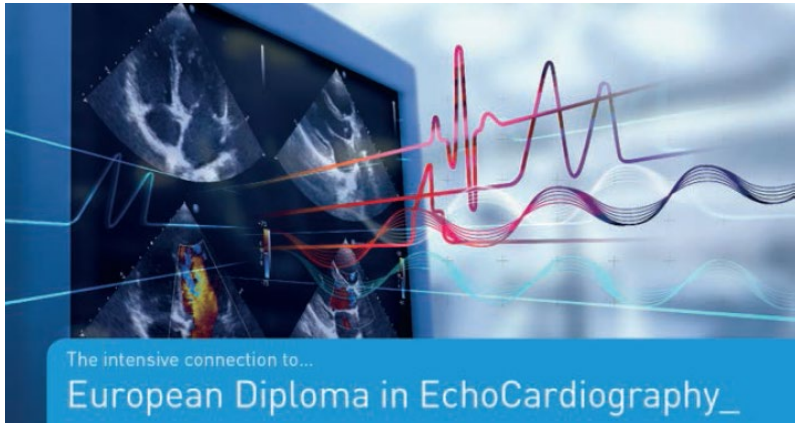
Echo-guided kardioverze

Martin Balík

Komplexní kardiovaskulární centrum, KARIM 1.LF UK a VFN Praha
e-mail: martin.balik@vfn.cz



Conflict of interest

- Research grants: AZV 18-06-00417 (Prospective randomized double-blind study of efficacy and safety of 1c class antiarrhythmic agent (propafenone) for supraventricular arrhythmias in septic shock), AZV NU22-B-147 (Impact of SARS-CoV-2 viral load estimate on therapeutic effects of remdesivir), Gilead Sciences 2021-22 (Immune boosting in severe Covid19)
- Research support: ESICM Stoutenbeek Award (Dutch Society of Critical Care)
- Inventor and patent holder: Lactocitrate®, EU patent (EP2609915B1), Canadian patent (No.2799624)
- Speaker Fees: FMC, GML-Biomedica, Gilead Sciences, BBraun, AOP Orphan
- Grant to organize educational meetings: None
- Advisory board: AOP Orphan

Incidence, risk factors and outcomes of new-onset atrial fibrillation in patients with sepsis: a systematic review

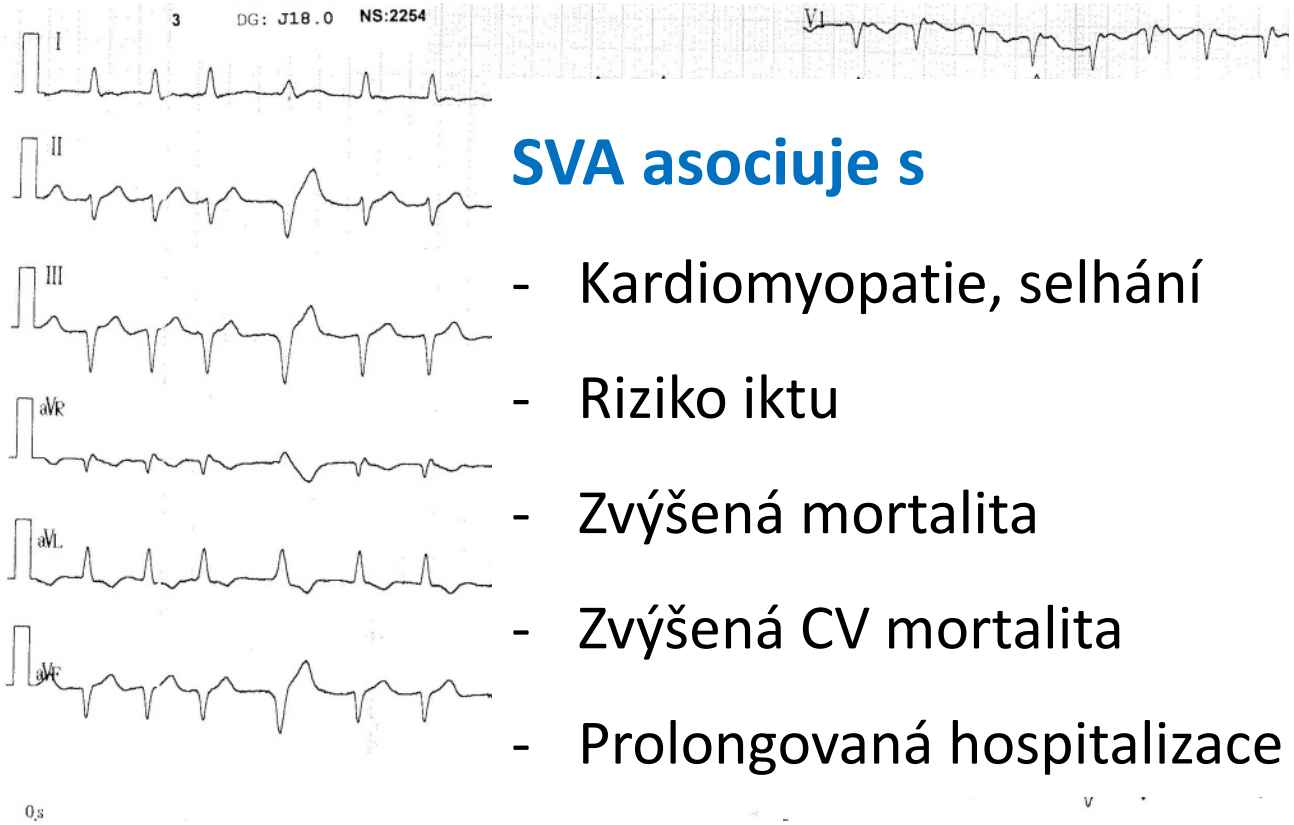
Critical Care 2014, **18**:688 doi:10.1186/s13054-014-0688-5

Clinical review: Treatment of new-onset atrial fibrillation in medical intensive care patients – a clinical framework

Mengalvio E Sleeswijk[1], Trudeke Van Noord[2], Jaap E Tulleken[2], Jack JM Ligtenberg[2], Armand RJ Girbes[3] and Jan G Zijlstra[2]

Critical Care 2007, **11**:233 (doi:10.1186/cc6136)

- **SV arytmie jako nejčastější spouštěč diastolického srdečního selhání**
- Intenzivní péče
  - 4-9-15% (věkově závislé)
  - 15-40% perioperační
- Incidence a závažnost stavu
  - 10% (4-23%) sepse
  - 23% (6-46%) septický šok
- Endemický problém
  - 25% populace nad 40 let !



SVA asociuje s

- Kardiomyopatie, selhání
- Riziko iktu
- Zvýšená mortalita
- Zvýšená CV mortalita
- Prolongovaná hospitalizace

SVA a NOAF nezávisle zhoršují prognózu – proč každého nevertujeme na sinus ?

Review Article

Management of Atrial Fibrillation in Critically Ill Patients

Mattia Arrigo, Dominique Bettex, and Alain Rudiger

Ztráta síňové systoly u 6-21% ICU pacientů – asociuje s 2-5x zvýšenou mortalitou !

Received: 7 October 2021 | Revised: 11 November 2021 | Accepted: 30 November 2021

DOI: 10.1111/aas.14007

RESEARCH ARTICLE

acta Anaesthesiologica Scandinavica

Disappointing Success of Electrical Cardioversion for New-Onset Atrial Fibrillation in Cardiosurgical ICU Patients*

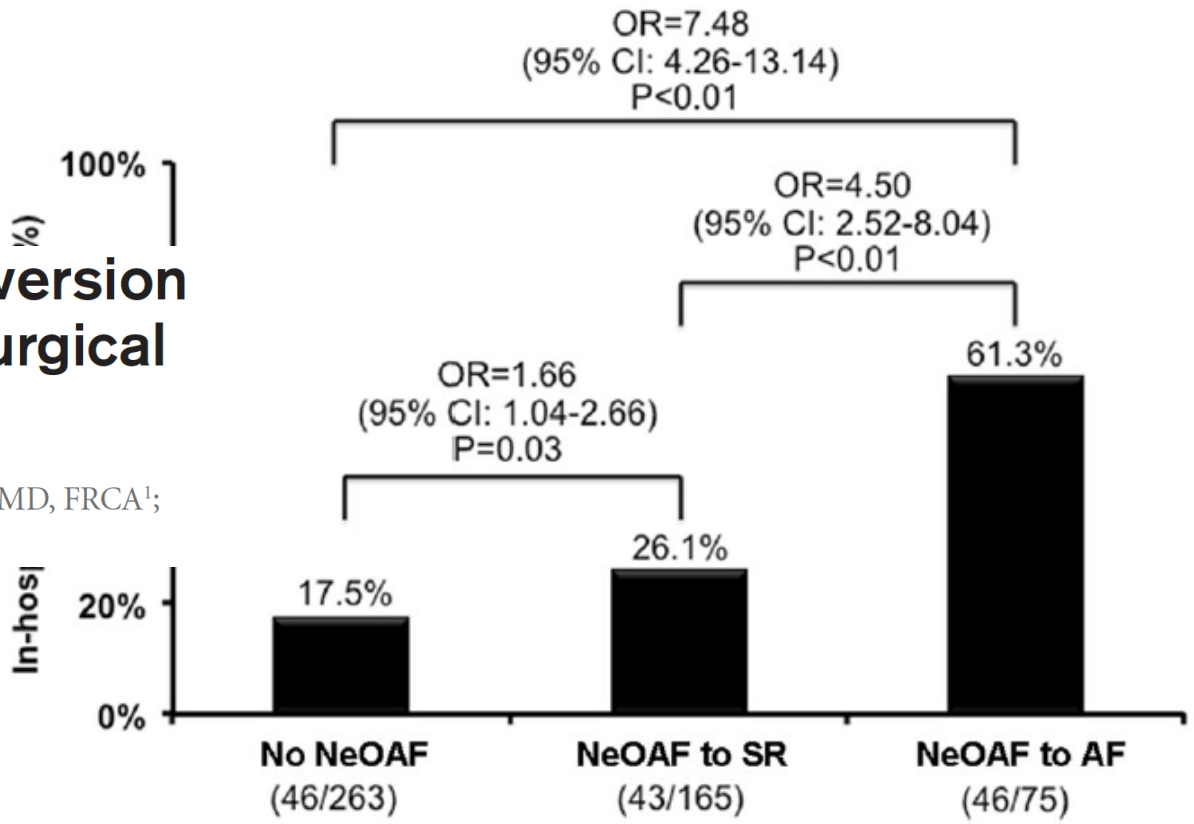
Mattia Arrigo, MD[1,2]; Natalie Jaeger, MD[1]; Burkhardt Seifert, PhD[3]; Donat R. Spahn, MD, FRCA[1]; Dominique Bettex, MD[1]; Alain Rudiger, MD[1]

- DC kardioverze – efekt v 24-30%, s antiarytmiky 70-80%
- rate control 4%

Prognostic impact of restored sinus rhythm in patients with sepsis and new-onset atrial fibrillation

Liu *et al. Critical Care* (2016) 20:373
DOI 10.1186/s13054-016-1548-2

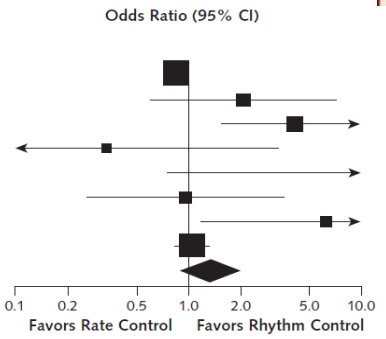
Wen Cheng Liu[1], Wen Yu Lin[1], Chin Sheng Lin[1], Han Bin Huang[2], Tzu Chiao Lin[1], Shu Meng Cheng[1], Shih Ping Yang[1], Jung Chung Lin[3] and Wei Shiang Lin[1*]

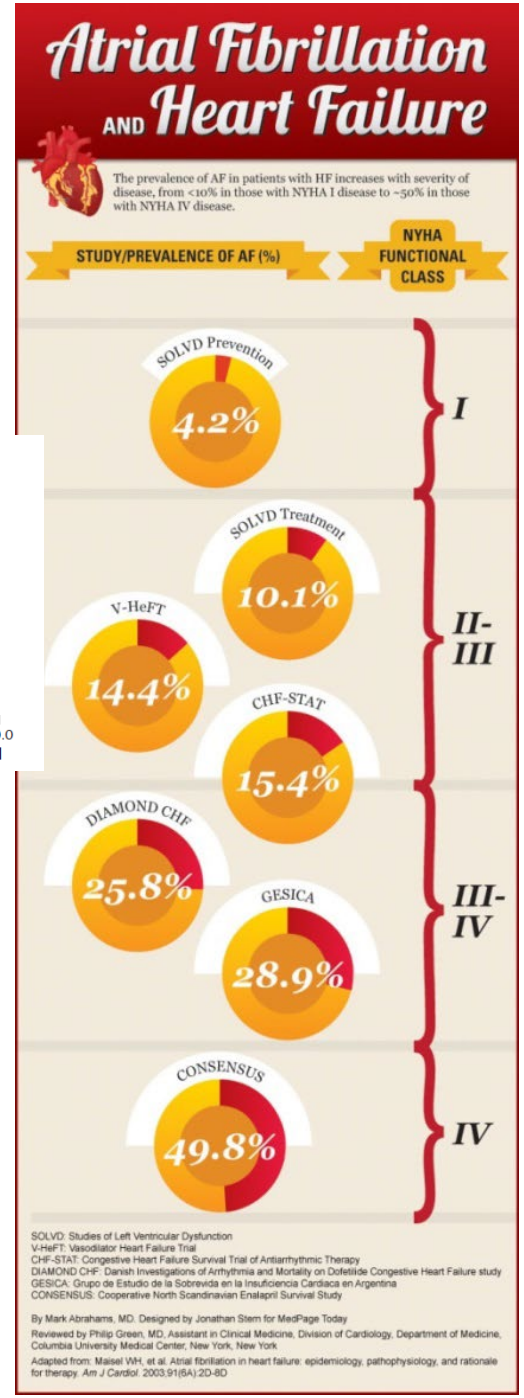


Rhythm nebo rate control ? Potřebujeme EBM+……

- Kardiologie: Rekurence SVA a SE antiarytmik…..důraz na rate control
- PRCT zařazovaly všechny stupně diastolické dysfunkce, bez stratifikace funkce LV a LA
- Hlavní PRCTs neukazují výhody rhythm vs rate control na
  - mortalitu, CV mortalitu
  - srdeční selhání
  - iktus
  - příjmy do nemocnice
- Celková frekvence kardioverze 80%
- AFFIRM Trial (J Am Coll Cardiol 2003)
- RACE Trial (N Engl J Med 2002)
- AF-CHF Trial (included EF_LV<35%, NYHA II-IV (N Engl J Med 2008)

Study, Year (Reference)	Odds Ratio (95% CI)	Deaths/Total, *n/N*	
		Rate Control	Rhythm Control
Wyse et al, 2002 (27)	0.851 (0.720–1.005)	310/2027	356/2033
Carlsson et al, 2003 (18)	2.087 (0.608–7.167)	8/100	4/100
Okçün et al, 2004 (20)	4.125 (1.562–10.895)	36/84	6/39
Opolski et al, 2004 (21)	0.337 (0.034–3.291)	1/101	3/104
Vora et al, 2004 (26)	14.099 (0.754–263.543)	5/40	0/45
Petrac et al, 2005 (22)	0.957 (0.260–3.532)	5/52	5/50
Yildiz et al, 2008 (28)	6.270 (1.185–33.192)	5/66	2/155
Talajic et al, 2010 (24)	1.048 (0.836–1.314)	228/694	217/682
Overall	1.343 (0.893–2.020)		





REVIEW | Annals of Internal Medicine

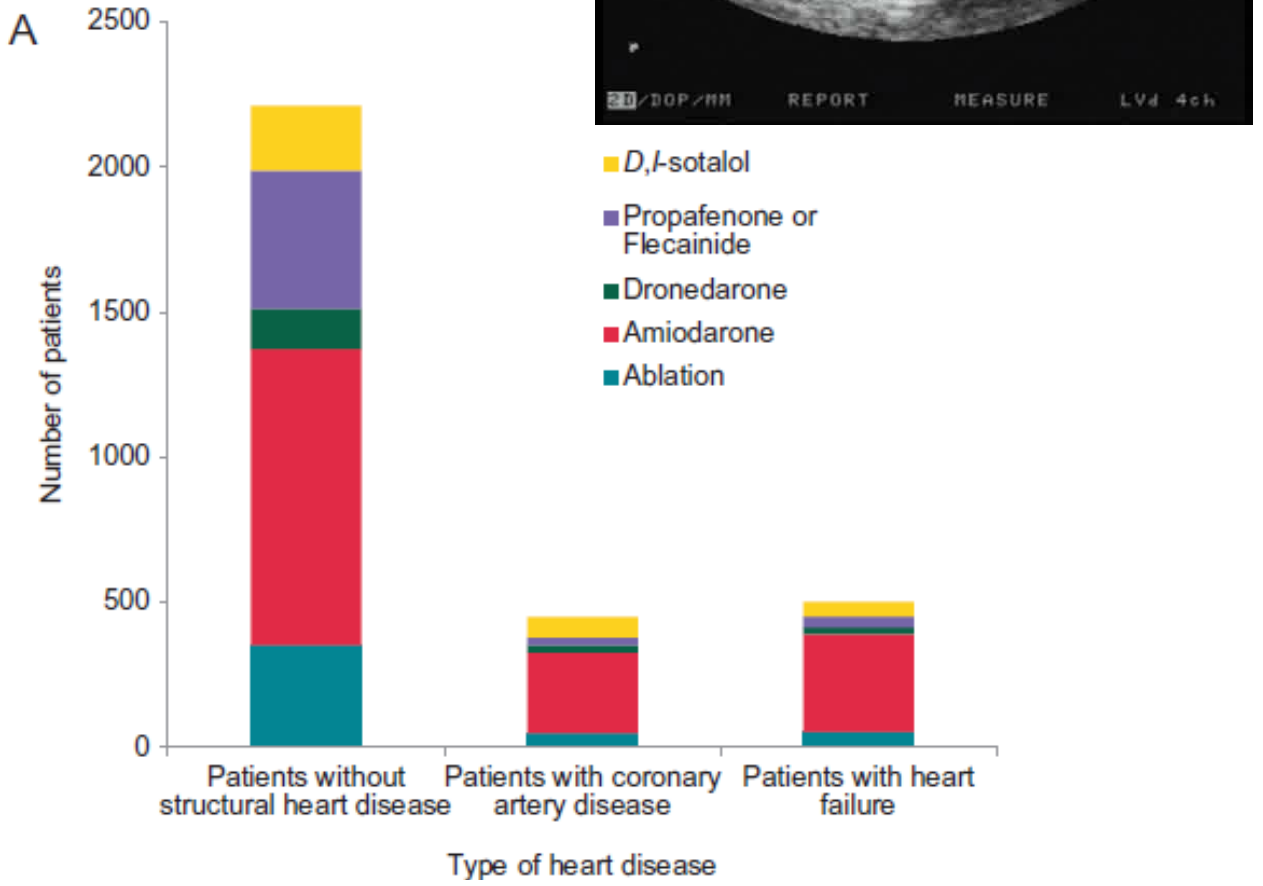
Rate- and Rhythm-Control Therapies in Patients With Atrial Fibrillation

A Systematic Review

Sana M. Al-Khatib, MD, MHS; Nancy M. Allen LaPointe, PharmD; Ranee Chatterjee, MD, MPH; Matthew J. Crowley, MD;

SVA: rozhodovací algoritmy

- Klíčová role echokardiografie:
  - LV velikost, kontraktilita ?
  - LVEDP, preload….katecholaminy ?
  - Chlopně: MS, MR, AS – sig. ?
  - Dilatace LA ?
  - Spont. echokontrast ?
  - PAPs ?
- Rhythm nebo rate control ?
- Elektrická kardioverze ?
- >48h ?: TEE
- Predictory udržitelnosti SR: 2D a Doppler ?
- Antikoagulace - nastavení
- Předchozí betablokátory
- Medikace při propuštění (betablokátory ?)

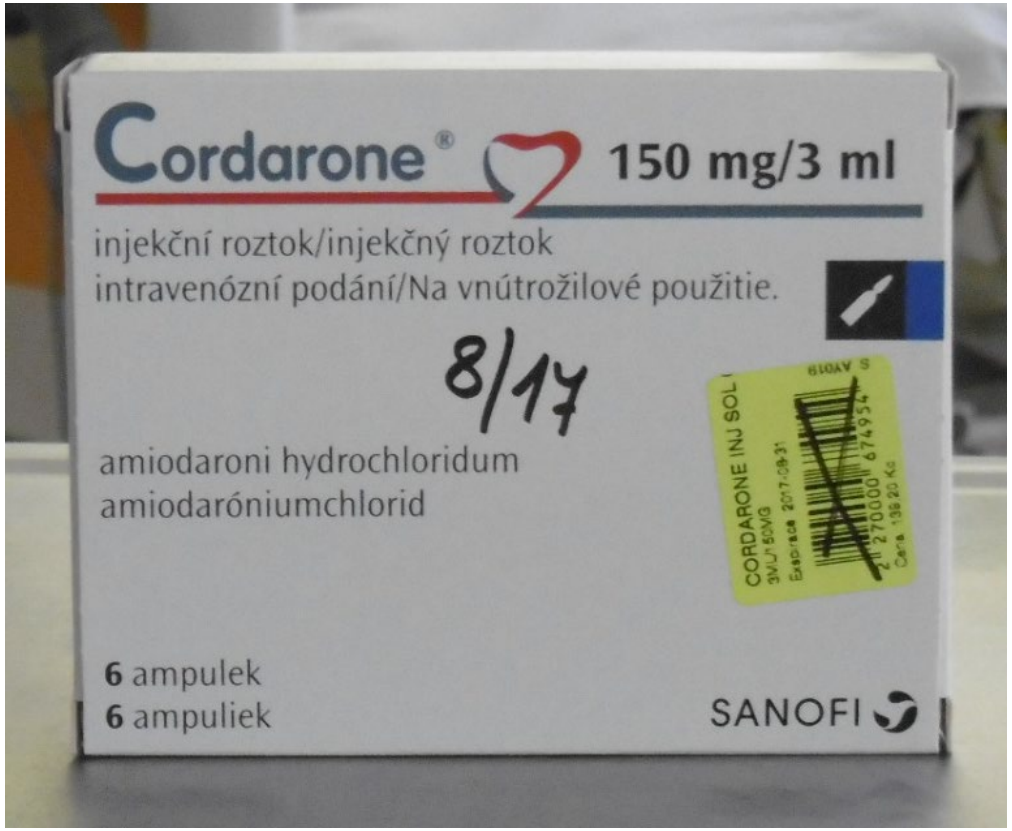


Europace (2014) **16**, 6–14
doi:10.1093/europace/eut263

CLINICAL RESEARCH
Atrial fibrillation

Amiodarone

- III class (V-W) antiarytmikum
- Nejméně kardiodepresivní
- Mírně vazodilatační
- Efekt u 80% NOAF – pomalejší než 1c class
- Synergismus s $MgSO_4$ i.v.
- Toxický již za pár dní podávání
  - Prolongovaný QTc
  - Plicní toxicita (3-14 dní…)
  - Hyperthyreoza, dlouhodobě hypothyreoza
  - Hepatotoxicita



Synonymem antiarytmika v intenzivní péči se stala nejvíce toxická medikace !

Toxicology and Applied Pharmacology 477 (2023) 116676

Contents lists available at ScienceDirect

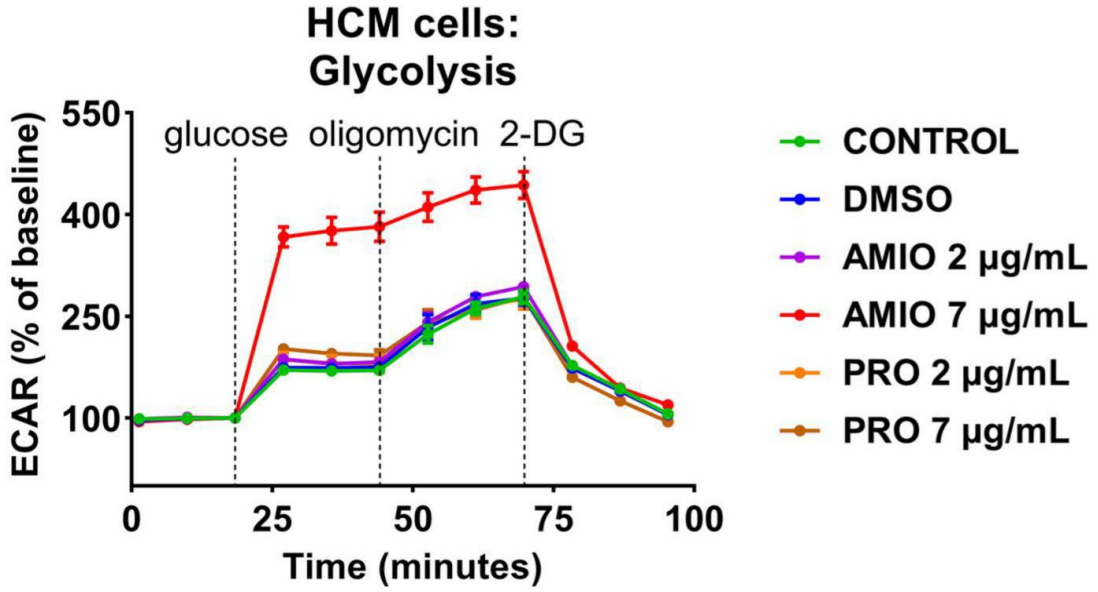
Toxicology and Applied Pharmacology

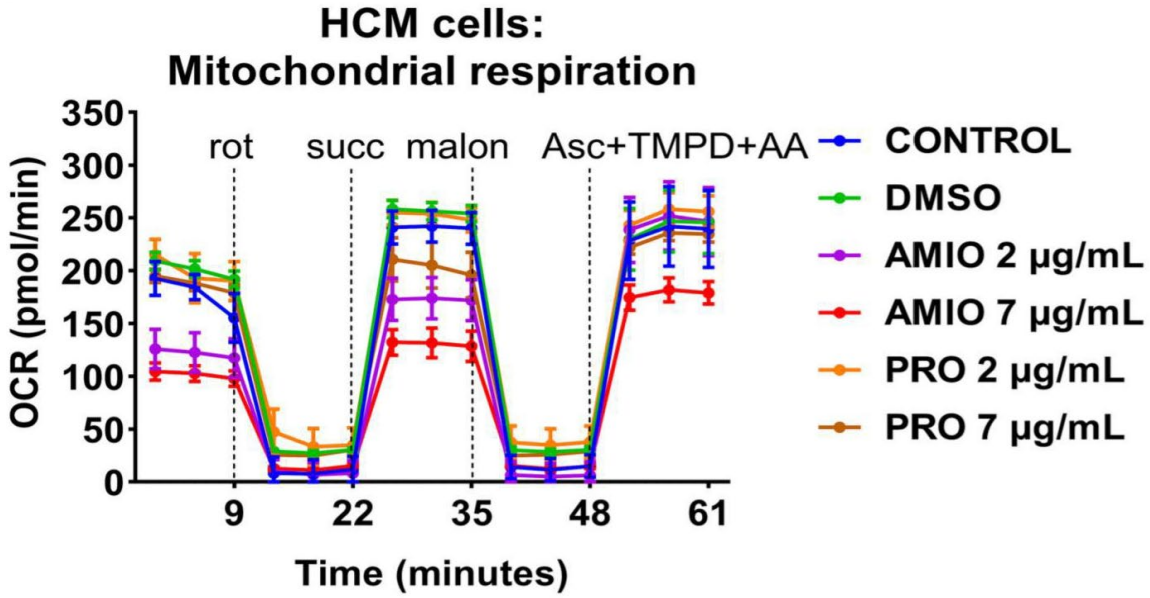
journal homepage: www.elsevier.com/locate/taap

Amiodarone but not propafenone impairs bioenergetics and autophagy of human myocardial cells

Adéla Krajčová [a], Vlasta Němcová [b], Milada Halačová [a,c], Petr Waldauf [a], Martin Balík [d], František Duška [a,*]

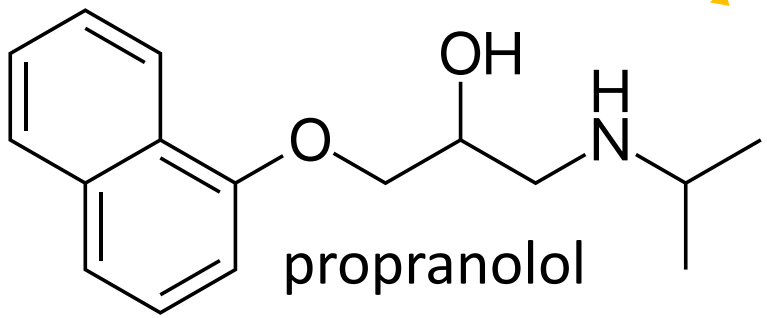
- 24h expozice terapeutickým hladinám amiodaron nebo propafenon: 2 a 7 ug/ml
- Amiodaron s dose-dependentním efektem na mitochondrial uncoupling, přepnutí z oxidativního metabolizmu na anaerobní glykolýzu s poklesem ATP
- Autofagie lidských kardiomyocytů
- Propafenone bezpečnější na buněčné úrovni
- Klinická implikace pro vysoké dávky amiodaronu ?



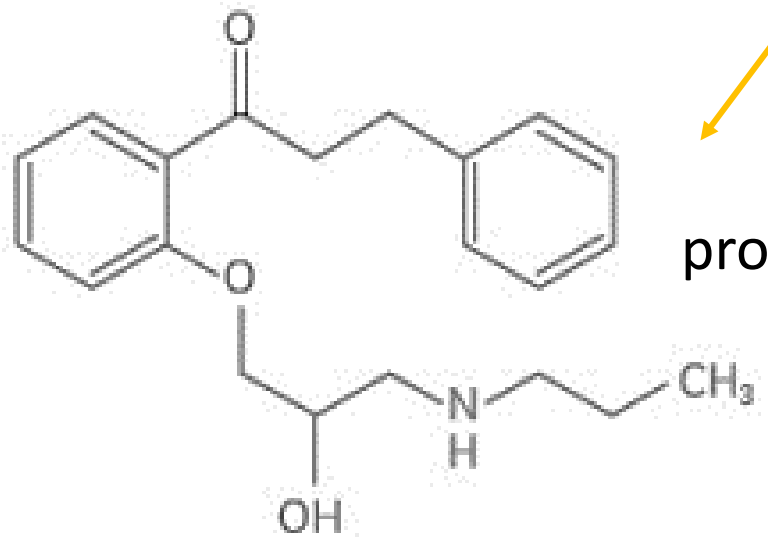


Propanolamine jako chemický základ betablokátorů….a většiny antiarytmik

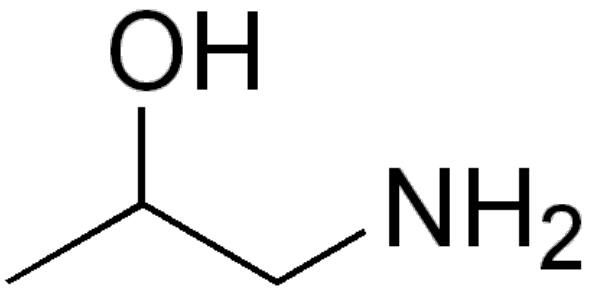
- Klasifikace antiarytmik: Vaughan-Williams
- Class II – betablokátory
- Class Ic - propafenone

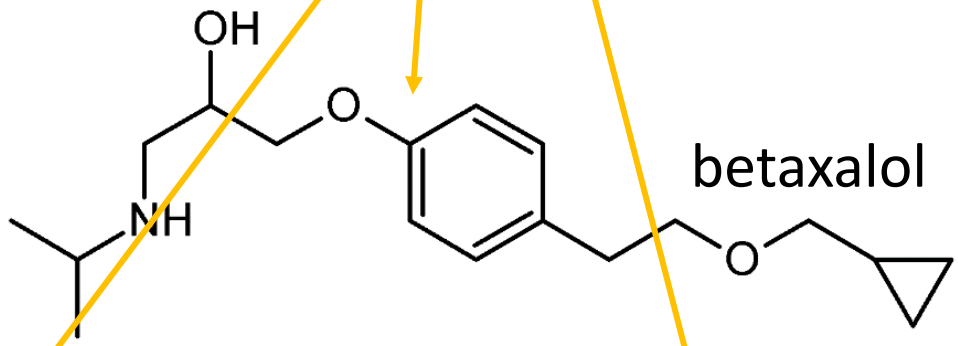


propranolol

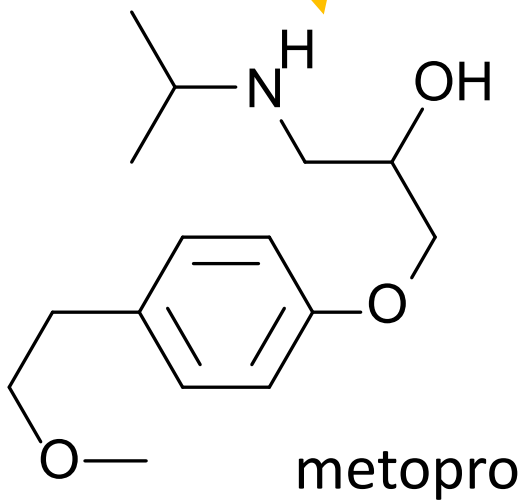


propafenone





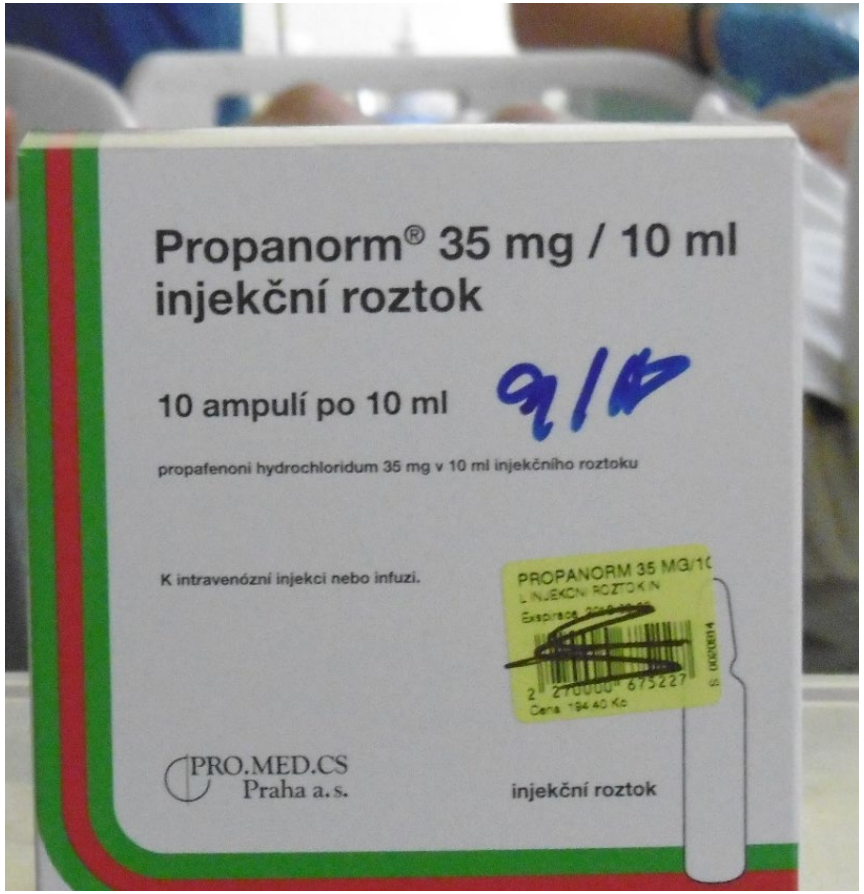
betaxalol



metoprolol

Propafenon

- Účinné a rychlé antiarytmikum (1-2h)
- Kontraindikován u
  - Těžké dysfunkce LK
  - Převodních poruch > Ist AV block
- Monitoring PQ
- Pozor na interakce v ARF a při zhoršení jater
- Flecainide/encainide nepopulární na ICU pro reportované fatální kazuistiky – dose related toxicity



VIA MEDICA

CASE REPORT

Cardiology Journal
2013, Vol. 20, No. 2, pp. 203–205
DOI: 10.5603/CJ.2013.0035

ISSN 1897–5593

Arrhythmogenic effect of flecainide toxicity

Pierre-Yves Courand[1], Franck Sibellas[1], Sylvain Ranc[1], Audrey Mullier[2], Gilbert Kirkorian[1], Eric Bonnefoy[1]

Obavy z 1c třídy V-W ?

The New England
Journal of Medicine

Volume 324 MARCH 21, 1991 Number 12

MORTALITY AND MORBIDITY IN PATIENTS RECEIVING ENCAINIDE, FLECAINIDE, OR PLACEBO

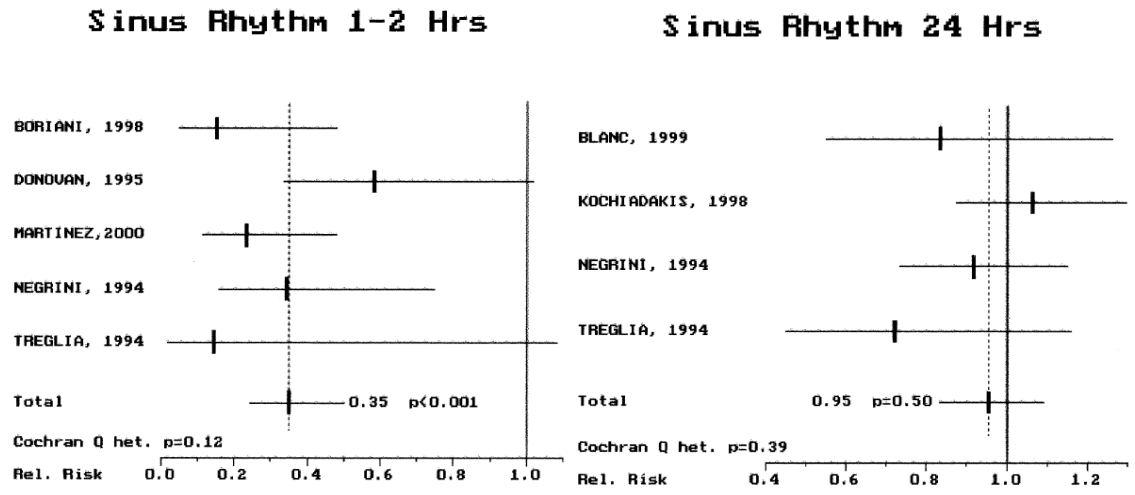
The Cardiac Arrhythmia Suppression Trial

- CAST Trial – pacienti s ischemic. chor. srdeční (post AMI) exponováni 1c class vs placebo
- 1c class vyšší mortalita, incl. EF_LV < 30% (!)
- Kardiologie, ambulanti – follow up 10 měsíců
- Nejvíce citovaná studie 1c třídy není aplikovatelná u kriticky nemocných !!!

Journal of the American College of Cardiology
© 2003 by the American College of Cardiology Foundation
Published by Elsevier Science Inc.
Vol. 41, No. 2, 2003
ISSN 0735-1097/03/$30.00
PII S0735-1097(02)02705-5

Amiodarone Versus Placebo and Class Ic Drugs for Cardioversion of Recent-Onset Atrial Fibrillation: A Meta-Analysis

Philippe Chevalier, MD, PHD,* Alexis Durand-Dubief, MD,* Haran Burri, MD,* Michel Cucherat, MD,† Gilbert Kirkorian, MD,* Paul Touboul, MD*



- 6 studií na amiodarone vs placebo a 6 na 1c class vs placebo
- propafenon peak efekt v 1-2h, srovnatelné s amiodaronem ve 24h

Journal of Critical Care 41 (2017) 16–23

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

234 patients with septic shock and SV arrhythmias

163 (69.7%) atrial fibrillation

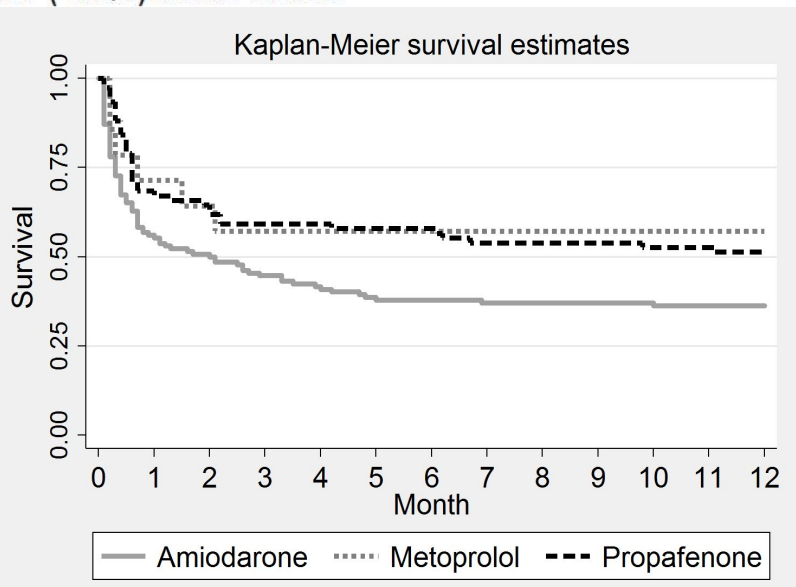
34 (14.5%) chronic atrial fibrillation

27 (11.5%) SVT

10 (4.3%) atrial flutter

Propafenone for supraventricular arrhythmias in septic shock—Comparison to amiodarone and metoprolol☆,☆☆

M. Balik [a,*], I. Kolnikova [a], M. Maly [a], P. Waldauf [b], G. Tavazzi [c], J. Kristof [a]



Fáze I: Antiarytmická účinnost (24h)

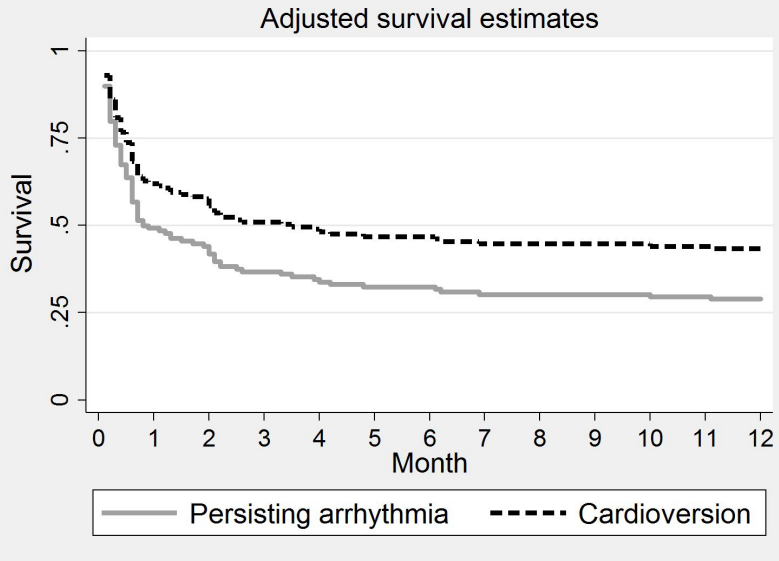
- Současná elektr. KV (23.7% amiodarone, 35.5% propafenone, ns)
- KV: 73.5% amiodarone, 88.9% propafenone, 92.3% metoprolol

Fáze II: Outcome

- ICU mortalita: amio 40.4%, propaf 30.4%, metoprolol 21.4% (all ns)
- 28-d. mortalita: amio 49.6%, propaf 39.5%, metoprolol 21.4% (all ns)

Zdůvodnění PRCT: outcome ve 12 měsících

- Přežití v propafenon jako metoprolol, vyšší než v amiodarone
- Adjusted 12m survival: HR amiod vs propaf 1.58 (1.04; 2.4), p=0.03
- Multivariatní analýza: 12m HR kardioverze versus akutní arytmie: HR 0.67, p=0.113



Propafenone vs Amiodarone in Septic Shock

Journal of Critical Care 41 (2017) 16–23

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

Propafenone for supraventricular arrhythmias in septic shock—Comparison to amiodarone and metoprolol☆,☆☆

M. Balik [a,*], I. Kolnikova [a], M. Maly [a], P. Waldauf [b], G. Tavazzi [c], J. Kristof [a]

Propafenone for supraventricular arrhythmias in septic shock—Comparison to amiodarone and metoprolol

Cardiovascular Drugs and Therapy
https://doi.org/10.1007/s10557-020-06998-8

SHORT COMMUNICAITON

Vasopressin in Patients with Septic Shock and Dynamic Left Ventricular Outflow Tract Obstruction

Martin Balik [1] · Adam Novotny [1] · Daniel Suk [1] · Vojtech Matousek [1] · Michal Maly [1] · Tomas Brozek [1] · Guido Tavazzi [2]

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

International Journal of Cardiology 266 (2018) 147–148

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Editorial

New-onset atrial fibrillation in critically ill patients – Implications for rhythm rather than rate control therapy?☆,☆☆,★,★★

M. Balik

Department of Anesthesiology and Intensive Care, 1st Faculty of Medicine, Charles University, General University Hospital, U nemocnice 2, Prague 2 128 08, Czechia

Reply

Anaesthesiology Intensive Therapy
2017, vol. 49, no 5, 419–429
ISSN 0209–1712
10.5603/AIT.a2017.0061

REVIEW

Management of arrhythmia in sepsis and septic shock

Martin Balik, Vojtech Matousek, Michal Maly, Tomas Brozek

Open access

BMJ Open

Efficacy and safety of 1C class antiarrhythmic agent (propafenone) for supraventricular arrhythmias in septic shock compared to amiodarone: protocol of a prospective randomised double-blind study

Martin Balik,[1] Petr Waldauf,[2] Michal Maly,[1] Vojtech Matousek,[1] Tomas Brozek,[1] Jan Rulisek,[1] Michal Porizka,[1] Robert Sachl,[1] Michal Otahal,[1] Petr Brestovansky,[1] Eva Svobodova,[1] Marek Flaksa,[1] Zdenek Stach,[1] Jaroslav Pazout,[2] Frantisek Duska,[2] Ondrej Smid,[3] Martin Stritesky[1]

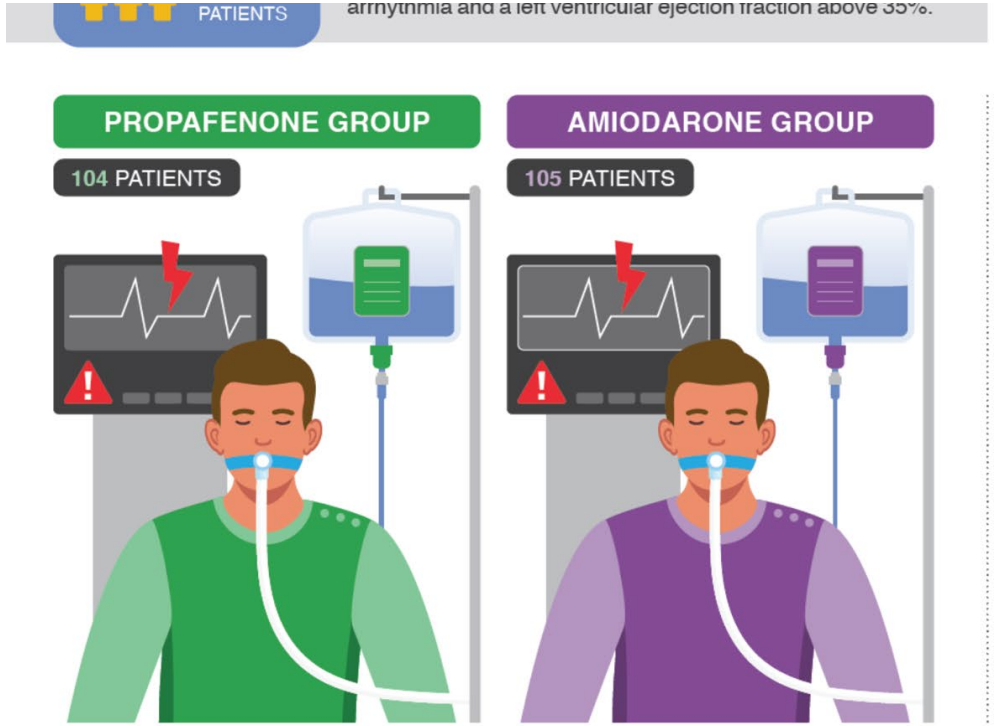
Propafenone vs Amiodarone in Septic Shock, ClinicalTrials.gov ID: NCT03029169

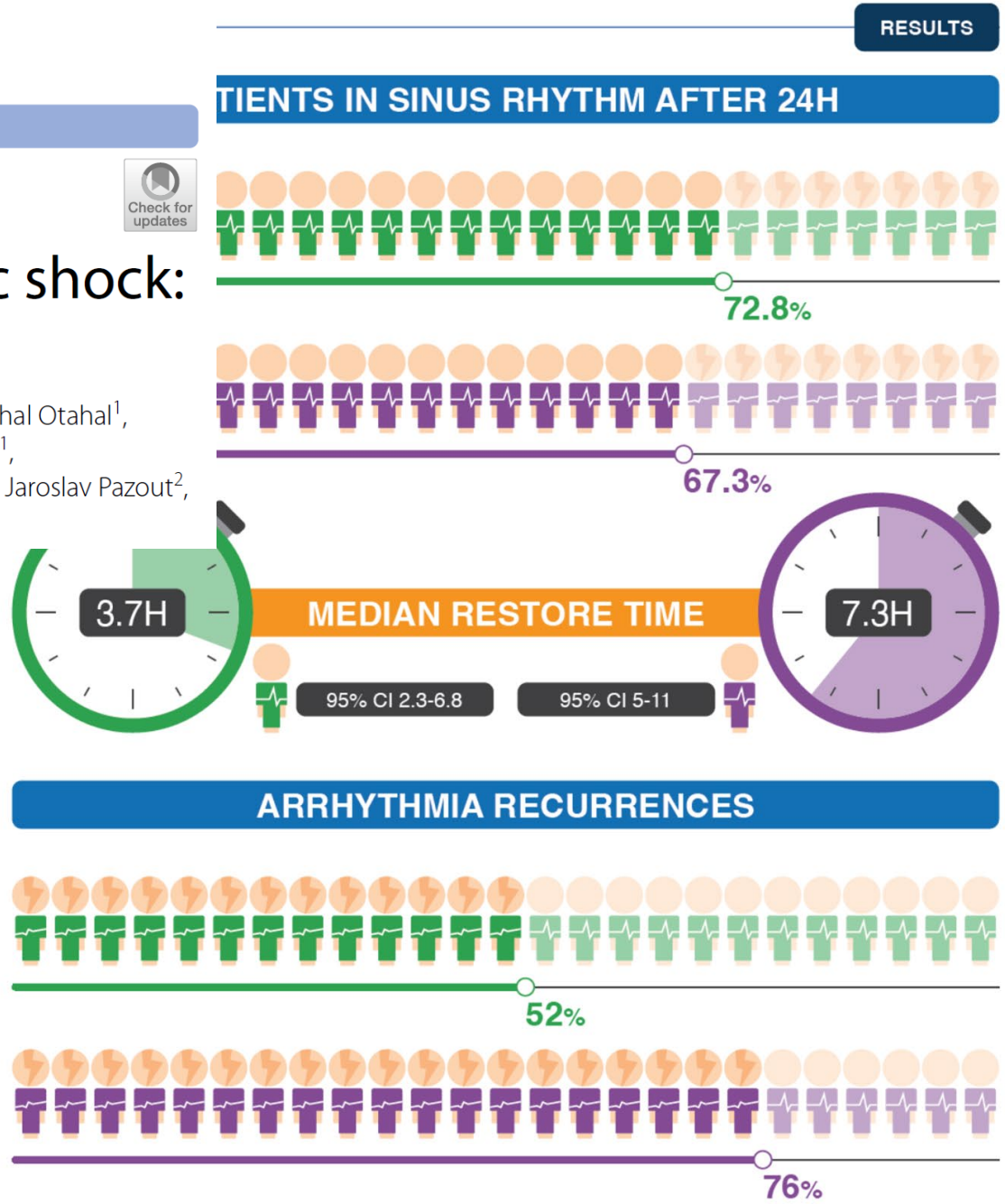
Intensive Care Med
https://doi.org/10.1007/s00134-023-07208-3

ORIGINAL

Propafenone versus amiodarone for supraventricular arrhythmias in septic shock: a randomised controlled trial

Martin Balik[1*], Michal Maly[1], Tomas Brozek[1], Jan Rulisek[1], Michal Porizka[1], Robert Sachl[1], Michal Otahal[1], Petr Brestovansky[1], Eva Svobodova[1], Marek Flaksa[1], Zdenek Stach[1], Jan Horejsek[1], Lukas Volny[1], Ivana Jurisinova[1], Adam Novotny[1], Pavel Trachta[1], Jan Kunstyr[1], Petr Kopecky[1], Tomas Tencer[2], Jaroslav Pazout[2], Jan Belohlavek[3], Frantisek Duska[2], Adela Krajcova[2] and Petr Waldauf[2]



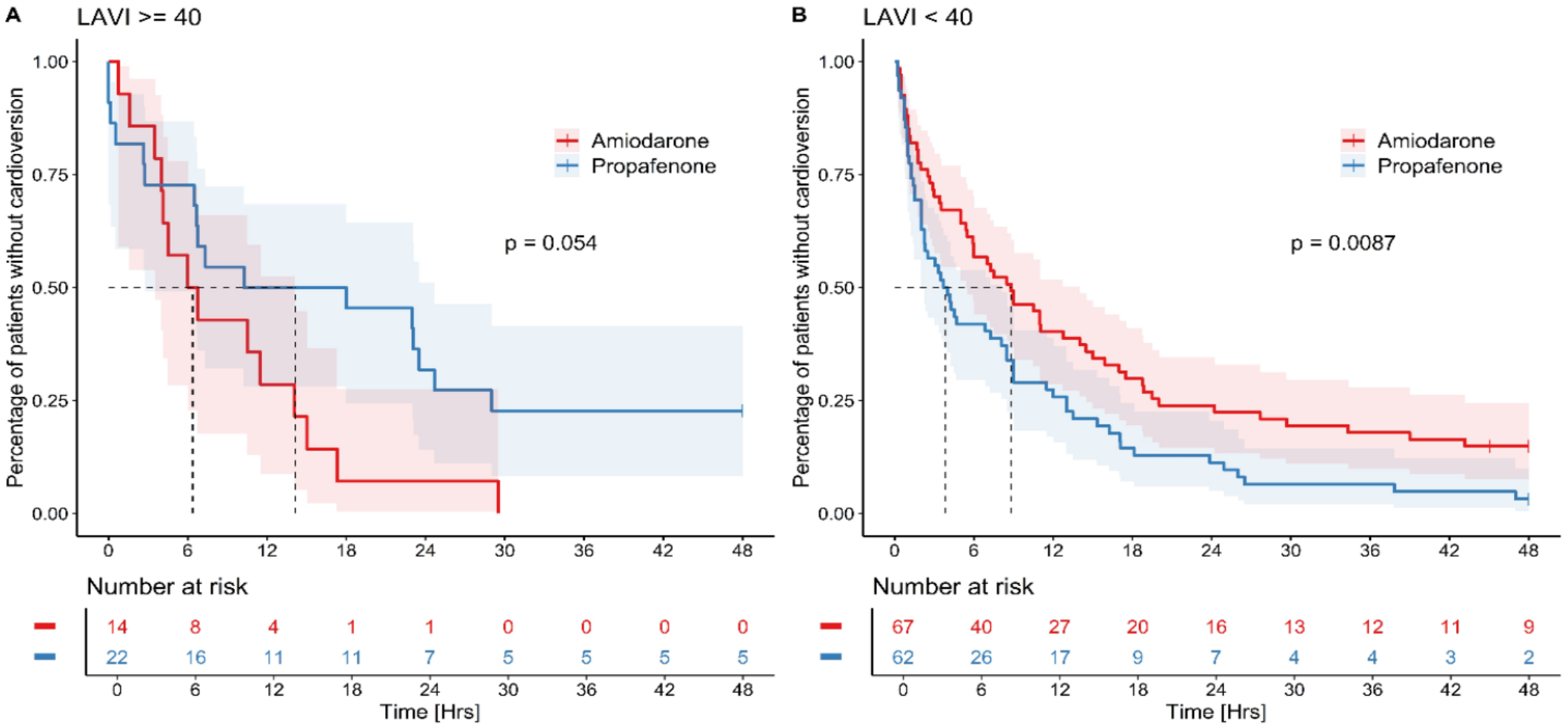


Nedilatovaná LA: p=0.04 pro primary outcome SR ve 24h (propafenon vs amio)

24h: LAVI< 40 ml/m^2 sinus v 81.3% propafenon vs 65.7% amiodaron (p=0.04)

LAVI< 40 ml/m^2 lépe s propafenon (p=0.009): 3.6 (2.0; 7.25)h vs 8.5 (5.0;12.8)h v amiodaron

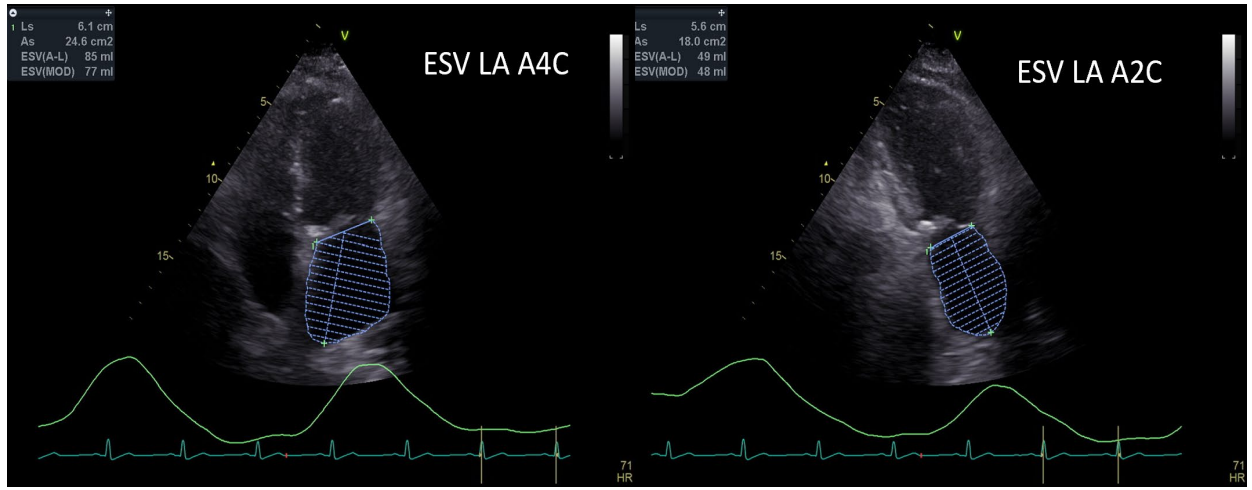
LAVI≥ 40 ml/m^2 v amiodaronu (p=0.05): 6.4 (3.5; 14.1)h do KV vs 18 (2.8; 24.7)h v propafenonu

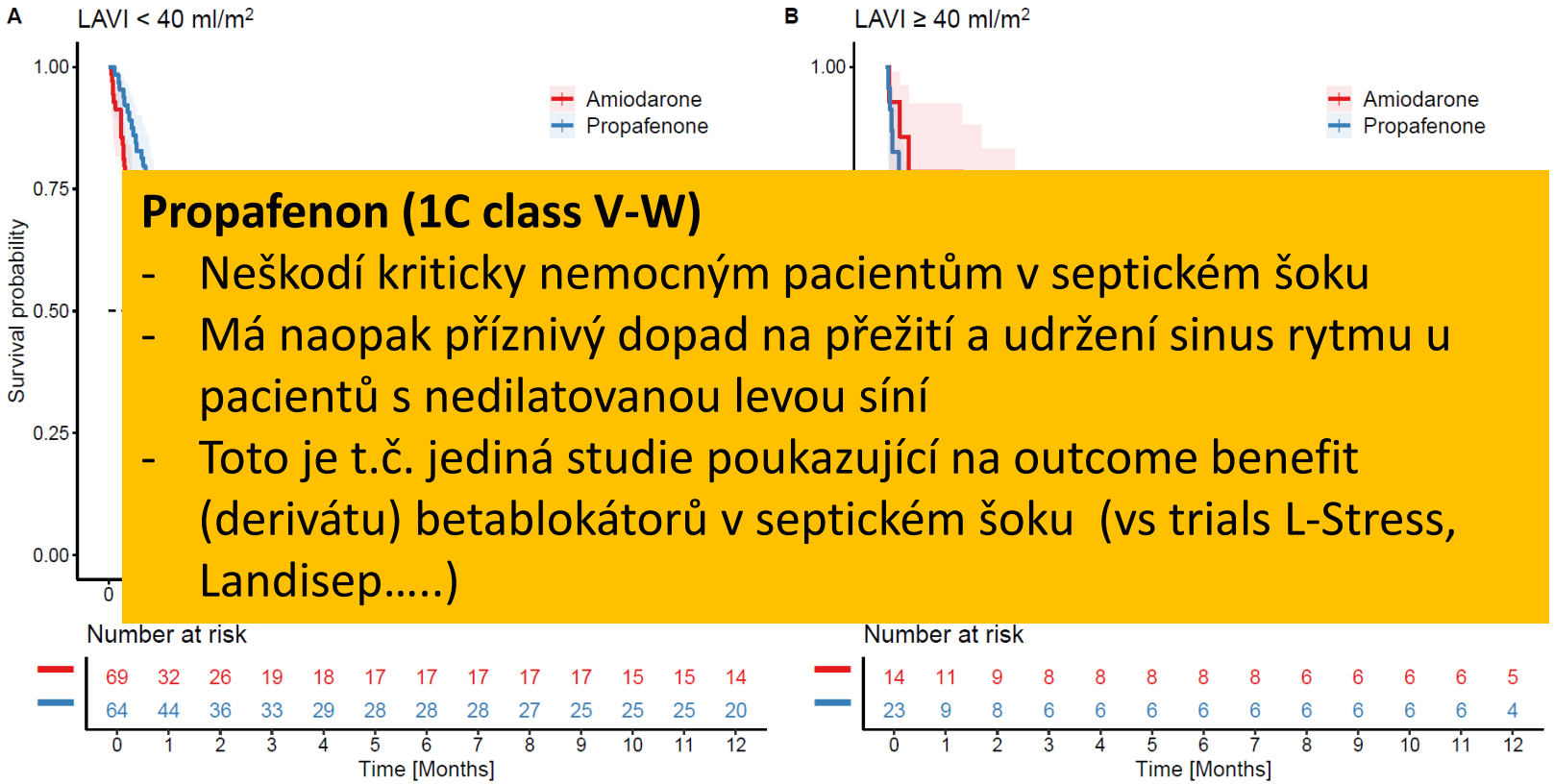


ESC European Society of Cardiology
European Heart Journal: Acute Cardiovascular Care (2024) **00**, 1–9
https://doi.org/10.1093/ehjacc/zuae023
ORIGINAL SCIENTIFIC PAPER
General intensive care

The outcomes of patients with septic shock treated with propafenone compared to amiodarone for supraventricular arrhythmias are related to end-systolic left atrial volume

Petr Waldauf[1], Michal Porizka[2], Jan Horejsek[2], Michal Otahal[2], Eva Svobodova[2], Ivana Jurisinova[2], Michal Maly[2], Tomas Brozek[2], Jan Rulisek[2], Pavel Trachta[2], Tomas Tencer[1], Adela Krajcova[1], Frantisek Duska[1], and Martin Balik [2]*





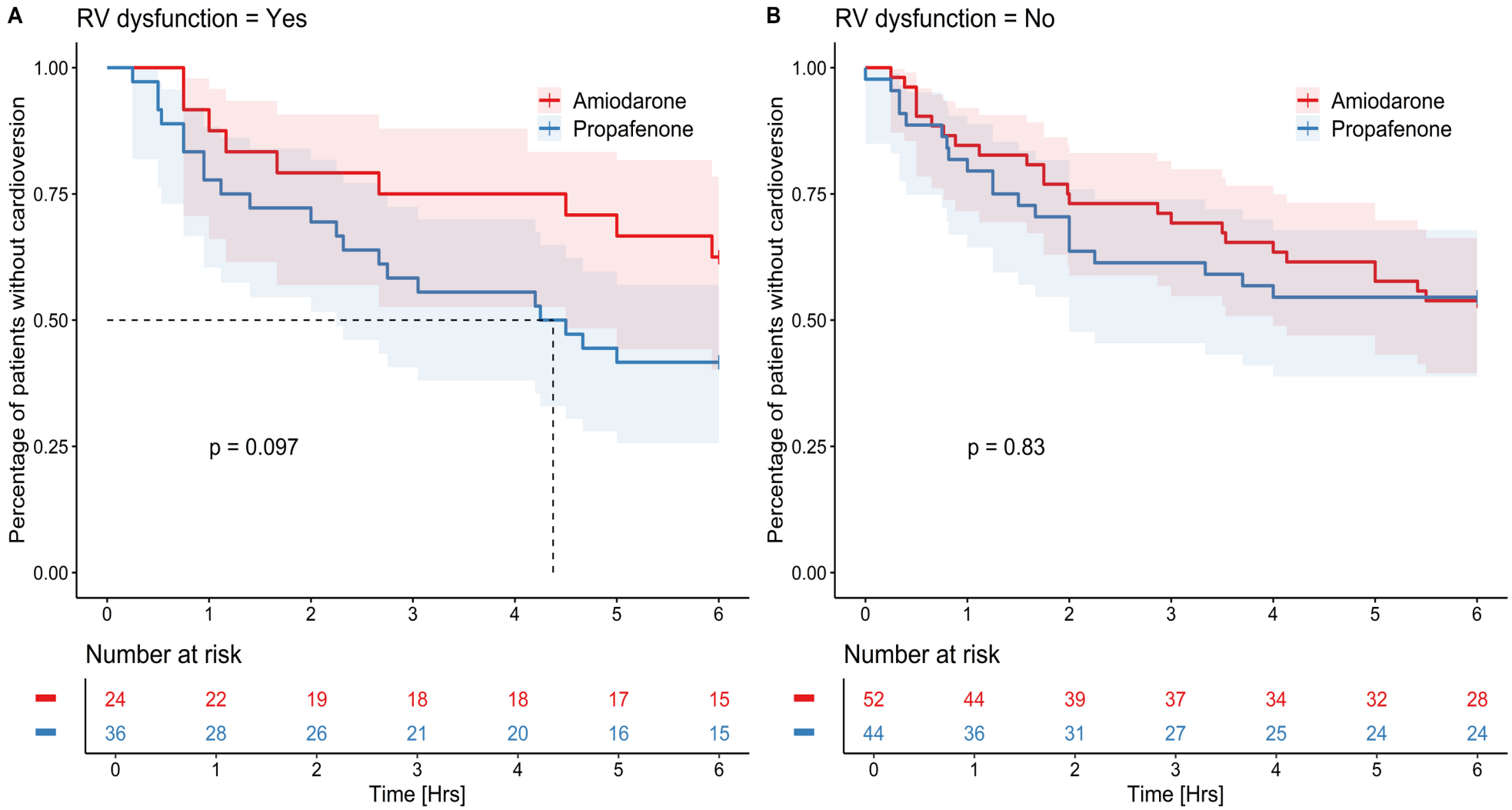
Propafenon (1C class V-W)

- Neškodí kriticky nemocným pacientům v septickém šoku
- Má naopak příznivý dopad na přežití a udržení sinus rytmu u pacientů s nedilatovanou levou síní
- Toto je t.č. jediná studie poukazující na outcome benefit (derivátu) betablokátorů v septickém šoku (vs trials L-Stress, Landisep.....)

- LAVI<40 ml/m²
  - mortalitní benefit propafenonu 1-měsíc (p=0.007), 1-rok (p=0.013)
  - HR 0.60 pro mortalitu 1-rok (p=0.014)
- LAVI≥40 ml/m²
  - Mortalita horší s propafenone 1-měsíc (p=0.03) a 6-m (p=0.052)
  - HR 3.6 pro mortalitu 1-měsíc (p=0.045)

Dysfunkční PK a SVA – propafenon nesignifikantně lepší

- 61(37.9%) pac. se středně-těžce dilatovanou PK, TAPSE<15 mm, PAPs>40 mmHg versus 100(62.1%) pac. s normální až mírně dysfunkční PK.

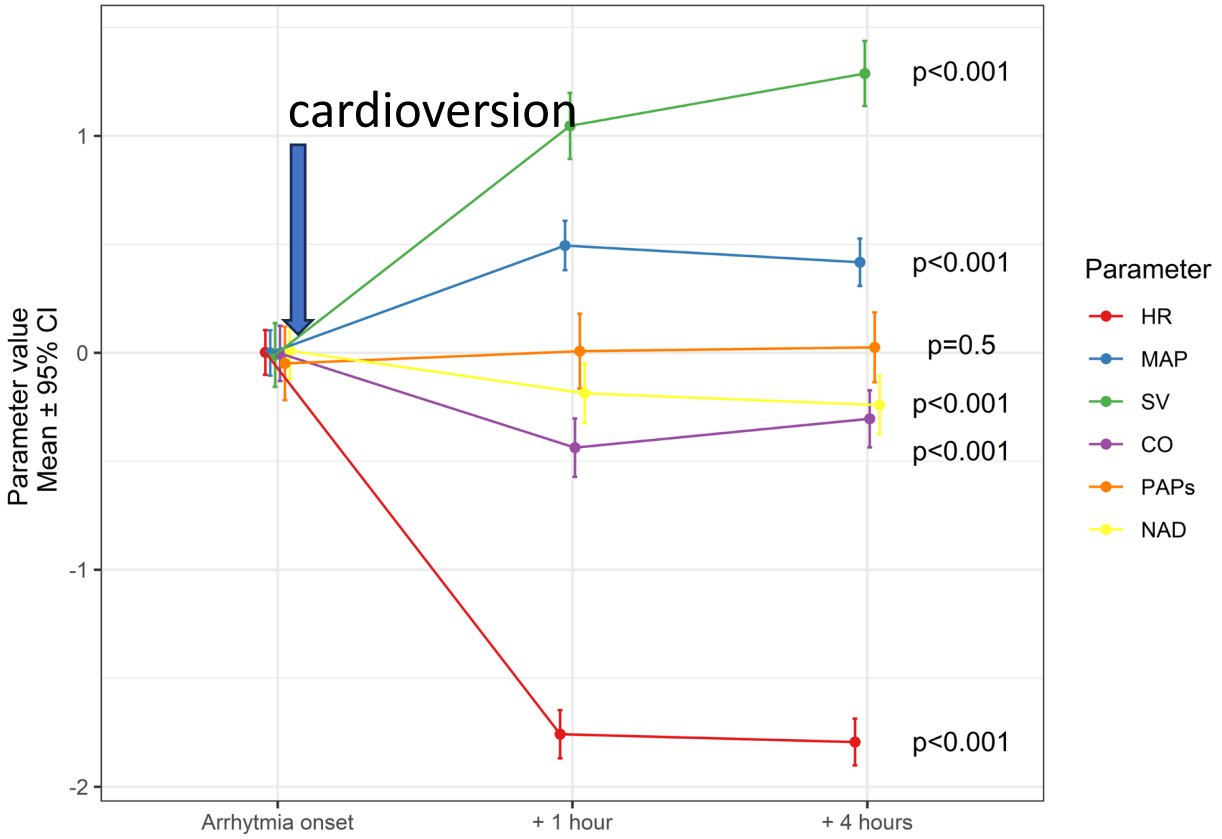


Co se změní s kardioverzí v septickém šoku ? Vliv pulzatilního toku….

Parameter	Arrhythmia onset (n=209)	Cardioversion +1h (n=173)	Cardioversion +4h (n=187)	p-value
HR (/min)	130 (111; 147)	85 (78; 96)	85 (77; 94)	**<0.001**
MAP (mmHg)	75 (70; 82)	80 (75; 85)	80 (75; 85)	**<0.001**
CVP (mmHg)	8.6 (8; 9.2)	8 (7.4; 8.6)	8.1 (7.5; 8.7)	**0.01**
SV (ml)	50 (42; 60)	66 (58; 78)	69 (60; 79)	**<0.001**
CO (l/min)	6.315 (5.332; 7.654)	5.496 (4.849; 6.656)	5.787 (4.862; 6.901)	**<0.001**
CI (l/min.m^2)	3.165 (2.618; 3.792)	2.839 (2.401; 3.304)	2.932 (2.450; 3.371)	**<0.001**

- MAP (⇧) = CO (⇩) x SVR(…NAD⇩)..?
- arytmie vs sinus po kardioverzi

PAPs (mmHg)	44 (37; 54)	47 (38; 54)	46 (37; 54)	0.5
SVR (dyn/s.cm^{-5})	867 (825; 909)	1064 (1020; 1107)	1003 (961; 1046)	**<0.001**
NAD (µg/kg.min) change of dosage	0.30 (0.15, 0.45)	0.25 (0.12, 0.40) -0.05 (-0.09; -0.02)	0.21 (0.10, 0.40) -0.07 (-0.1; -0.04)	**<0.001**
AVP (IU/h) change of dosage N of patients	2.00 (2.00, 3.00) N=55	2.00 (0.00, 2.00) -0.76 (-1.09; -0.42) N=42	2.00 (0.00, 2.00) -0.84 (-1.17; -0.52) N=49	**<0.001**
Dobutamine (µg/kg.min) N of patients	3.00 (2.75, 3.00) N=11	3.00 (2.50, 4.00) N=9	4.00 (3.00, 5.00) N=7	0.6



Contents lists available at ScienceDirect

Journal of Critical Care

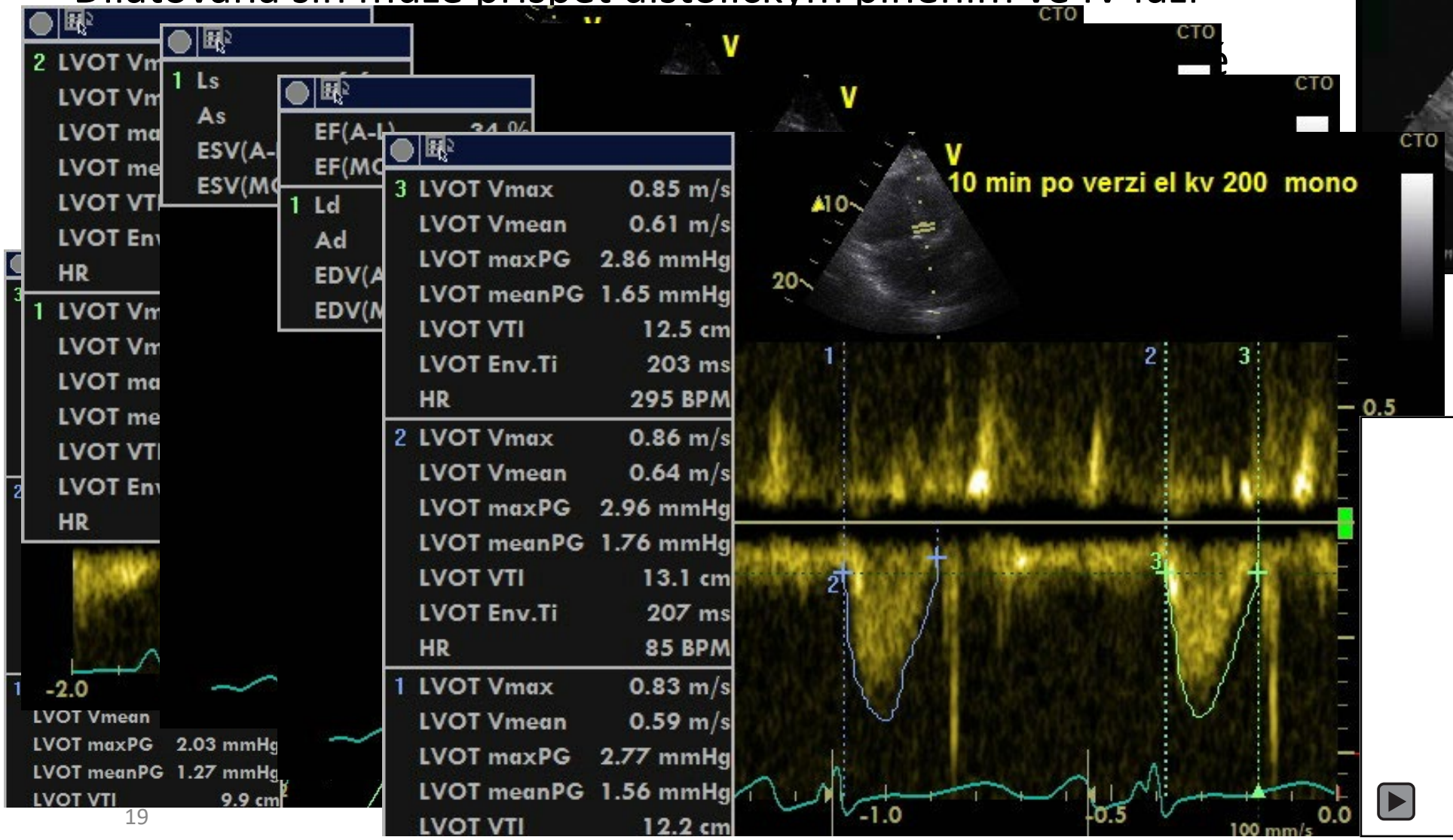
journal homepage: www.journals.elsevier.com/journal-of-critical-care

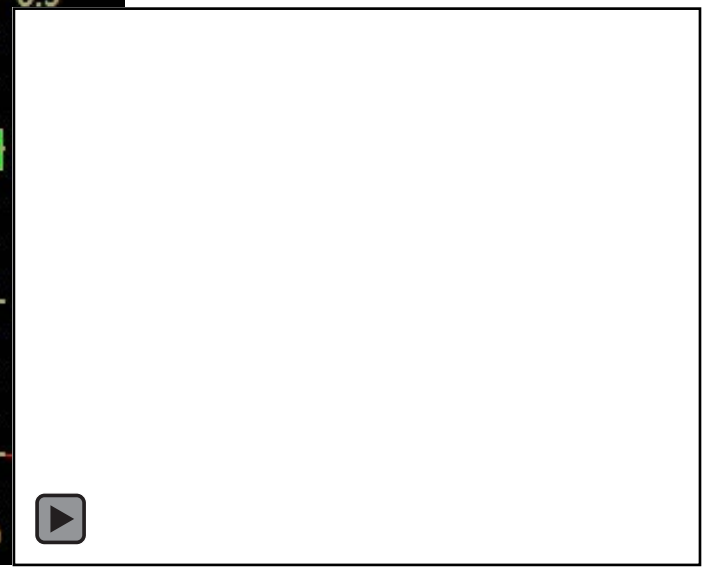
Echocardiography predictors of sustained sinus rhythm after cardioversion of supraventricular arrhythmia in patients with septic shock

M. Balik[a,*,1], P. Waldauf[b,1], M. Maly[a], T. Brozek[a], J. Rulisek[a], M. Porizka[a], R. Sachl[a],

2D a Doppler monitoring atriální funkce – může zdůvodnit rhythm control strategy

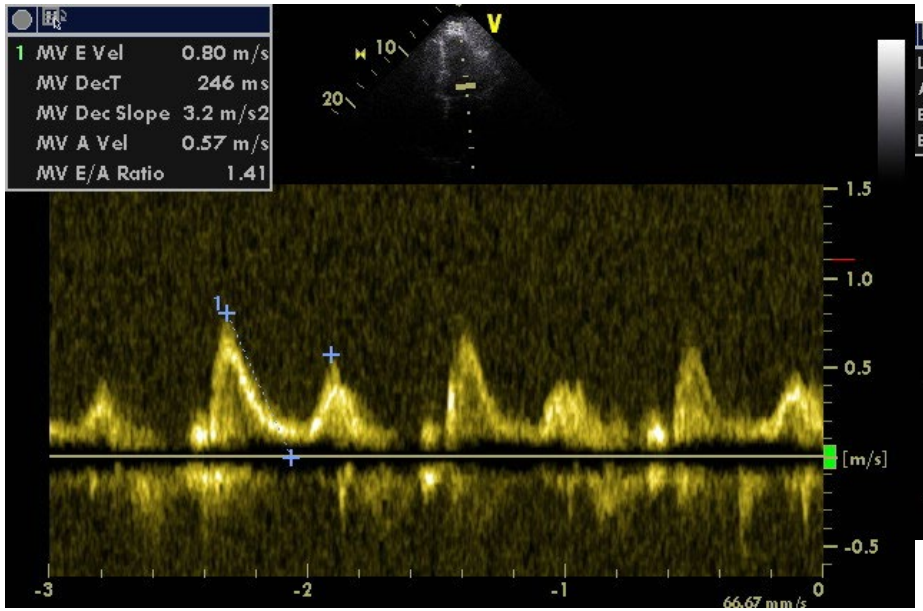
- Dilatovaná síň může přispět distolickým plněním ve IV fázi

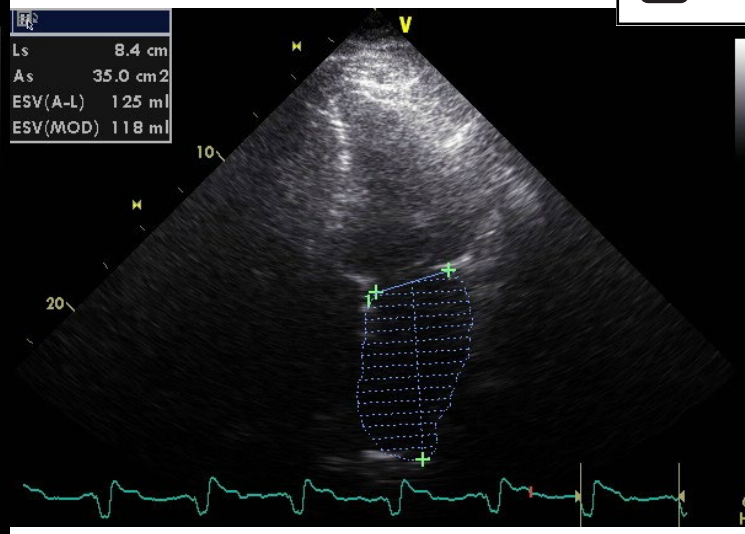


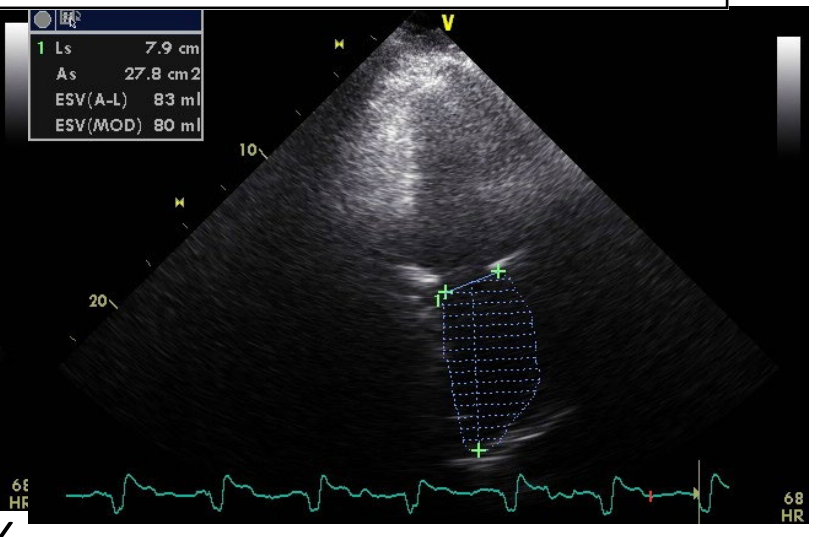


LA_EF a návrat systoly síní jako prediktor udržení sinusového rytmu

- Cut off 40 ml/m^2 LAVi modifikován
- Chronicky zvýšeným LAP
- Preload
- Indikátor diastolic. dysfunkce – ne kontraindikace ke KV a rhythm control
- A wave a Avti 1-4h po kardioverzi mohou zdůvodnit rhythm control strategii

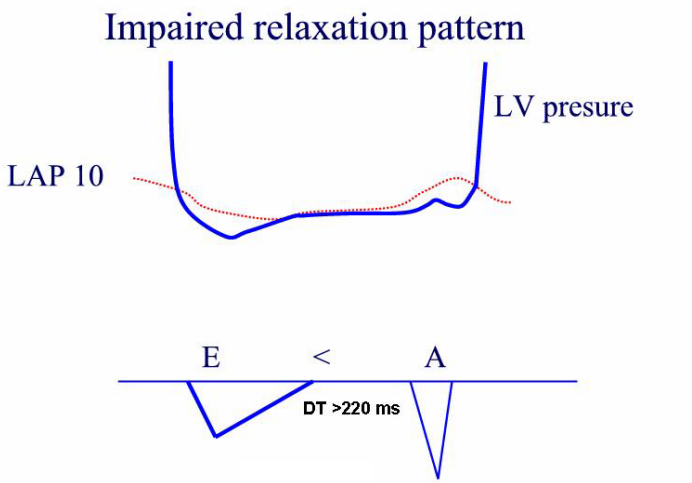


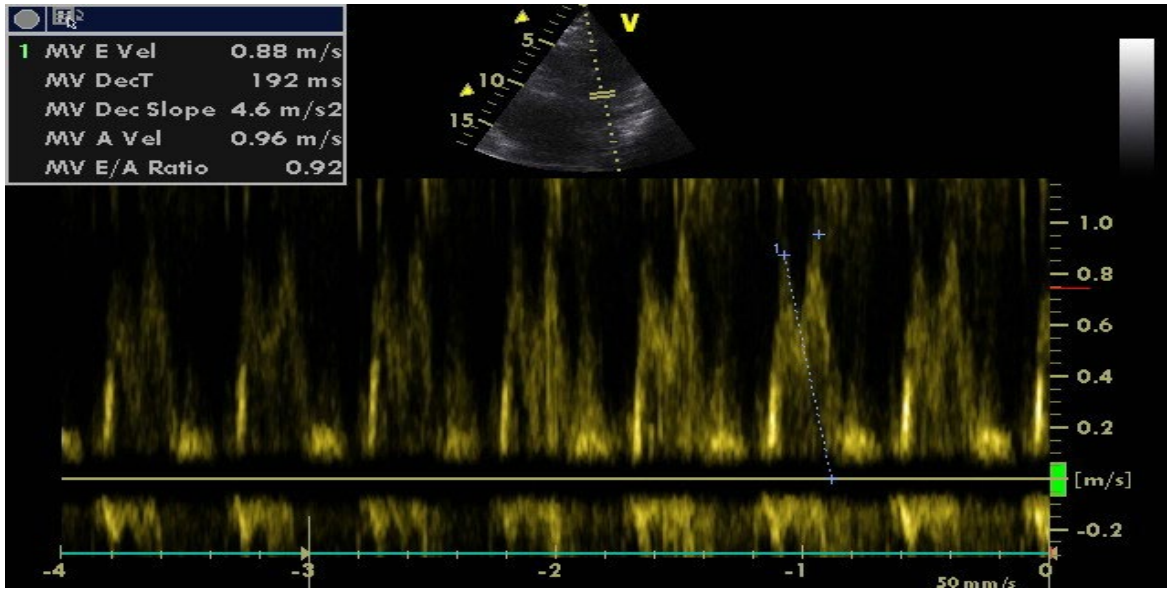


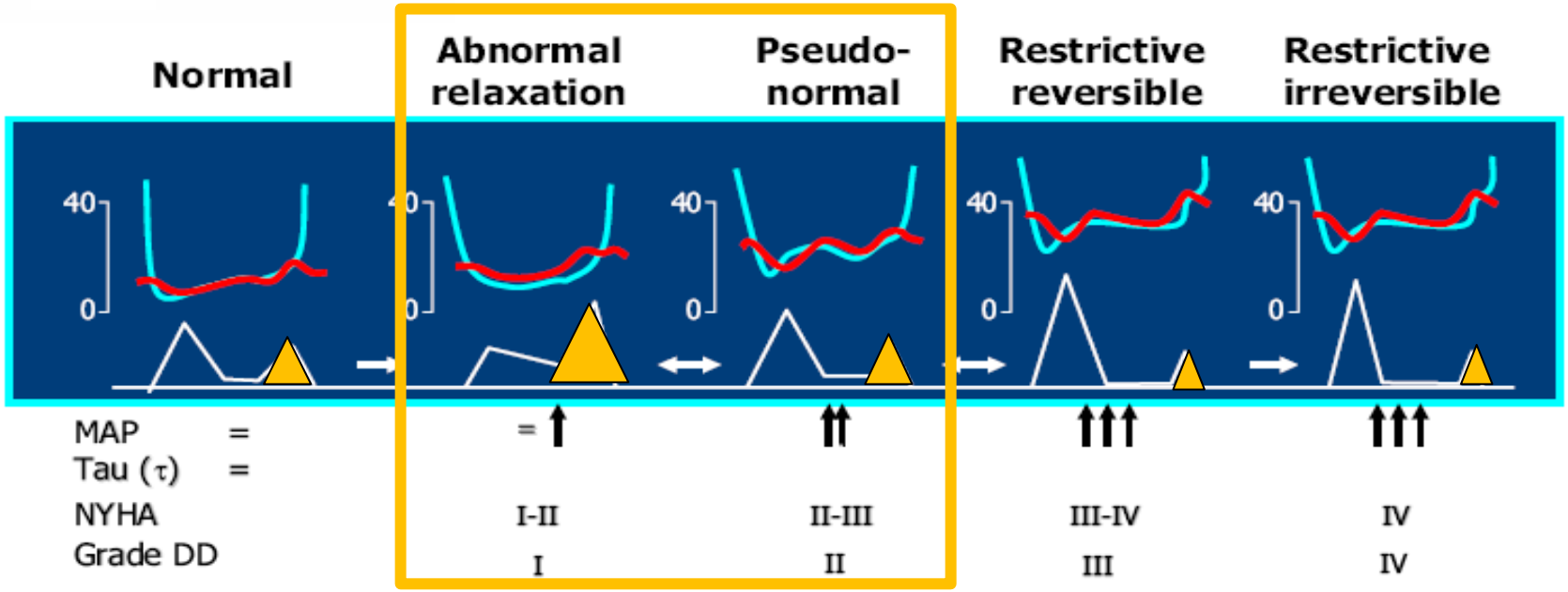


LA emptying fraction 32%

Stupeň závislosti komorového plnění na systole síní (= sinus rytmus)







Contents lists available at ScienceDirect

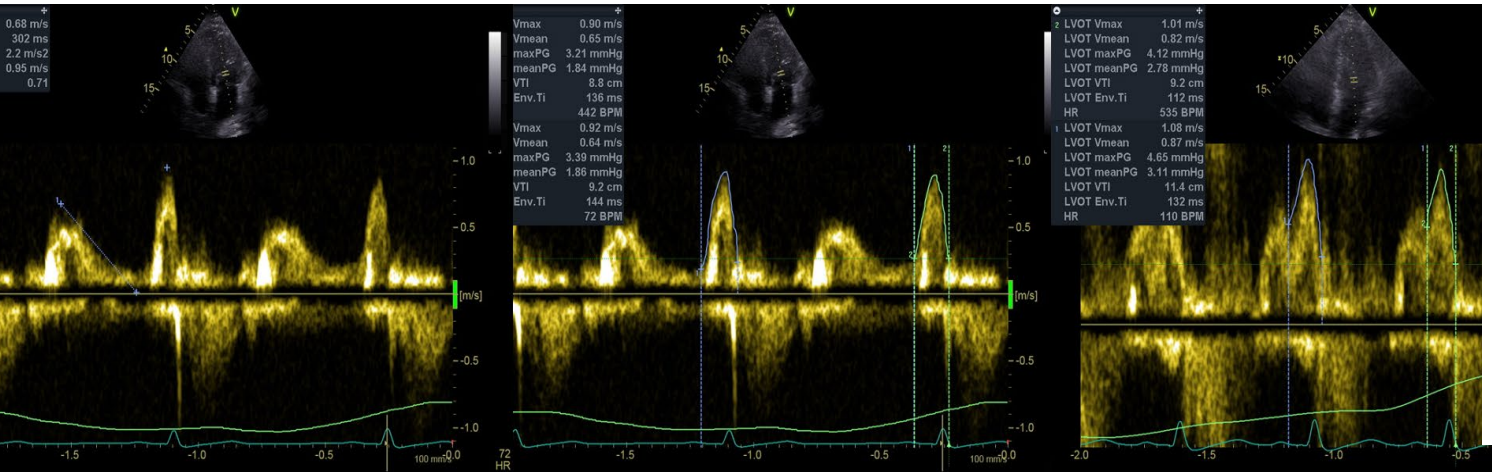
Journal of Critical Care

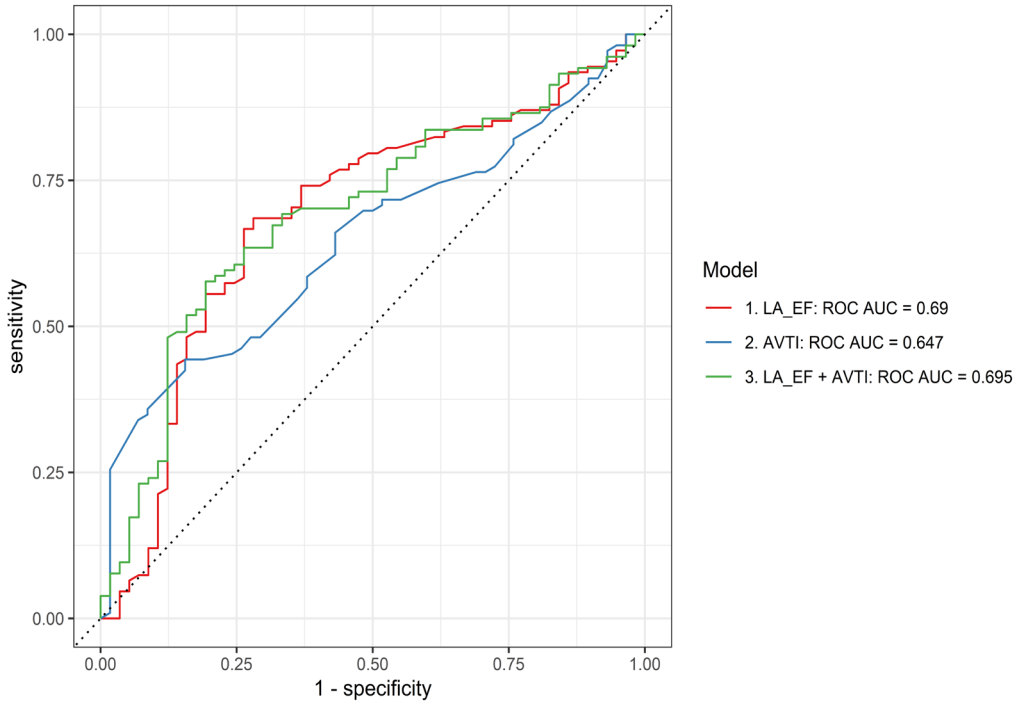
journal homepage: www.journals.elsevier.com/journal-of-critical-care

Echocardiography predictors of sustained sinus rhythm after cardioversion of supraventricular arrhythmia in patients with septic shock

M. Balik [a,*,1], P. Waldauf [b,1], M. Maly [a], T. Brozek [a], J. Rulisek [a], M. Porizka [a], R. Sachl [a], M. Otahal [a], P. Brestovansky [a], E. Svobodova [a], M. Flaksa [a], Z. Stach [a], J. Horejsek [a], L. Volny [a], I. Jurisinova [a], A. Novotny [a], P. Trachta [a], J. Kunstyr [a], P. Kopecky [a], T. Tencer [b], J. Pazout [b], A. Krajcova [b], F. Duska [b]

- LA_ESD a LAVI nestačí k predikci udržení SR (cut off ?)
- Echo guided kardioverze !





Parameter at CV +4h N of patients	0 recurrence N=65	1 recurrence N=41	2 recurrences N=28	3 recurrences N=16	>3 recurrences N=37	p-value
LA_EF (%)	44 (36, 49)	37 (28, 43)	31 (28, 38)	35 (31, 42)	30 (25, 36)	**<0.001**
Avti (cm)	8.65 (7.13, 9.50)	8.00 (6.25, 9.85)	7.85 (5.88, 8.85)	6.80 (6.00, 8.10)	6.50 (5.65, 8.30)	**0.007**

Echo a nastavení antikoagulace

Roční riziko centrální embolizace ve vztahu k velikosti LA a funkci LV

	risk(%)
• AF + normal echocardiogram	1·5
• AF + LA > 25 mm/m^2	8·8
• AF + global LV dysfunction	12·6
• AF + LA > 25 mm/m^2 + moderate/severe LV dysf.	20·0

- Stroke Prevention in Atrial Fibrillation Study Group Investigators. Ann Intern Med 1992
- Aiyrala S, et al: JASE 2011; 24(5): 499-505

- Moderate to severe MR may reduce risk of thrombus formation in dilated LA (Nakagami H: Am Heart J 1998; 136: 528-32)

Echokardiografie u SV arytmií

- Pravidelný RR (incl. pacing) a HR<100/min……Doppler jako u sinus rhythm (spec +/-80%)
- LVEDP assessment vč. dynamic maneuvres
- Valvular. etiology
- NOAF and chronic paroxysmal or persistent: Echo guided cardioversion
- Rate control in chronic permanent AF or on high vasopressors
- LV dysfunkce asociuje s prevalencí AF (až 50% u těžké LV dysfunkce na ICU)
- LA_ESD (PLAX), ≤45 mm<, biplanar LAVi, ≤40 ml/m^2< jako stratifikátory šance na rhythm control
- LA_EF, ≤37%<, A wave vč. Avti ≤8 cm< po KV jako prediktor udržení SR
- Echo guided priority pro antikoagulaci, vyloučení rizika embolizace (TEE) SVA>48h

Echokardiografie esenciální pro farmakoterapii + ev. elektrickou KV

- Ic class (propafenone) u normální až moderate LV dysf., Mg^{2+},K^{+}
- III class (amiodarone) u kontraindikace propafenonu
- II class (betablockers) u hyperkinetické cirkulace a hypertenze

Děkuji za pozornost !

Komplexní kardiovaskulární centrum
1. lékařská fakulta, Karlova Univerzita
Všeobecná fakultní nemocnice

U nemocnice 2; 128 08, Praha, EU
T: +420 224 962 243
F: +420 224 962 118
E: martin.balik@vfn.cz
www.karim-vfn.cz