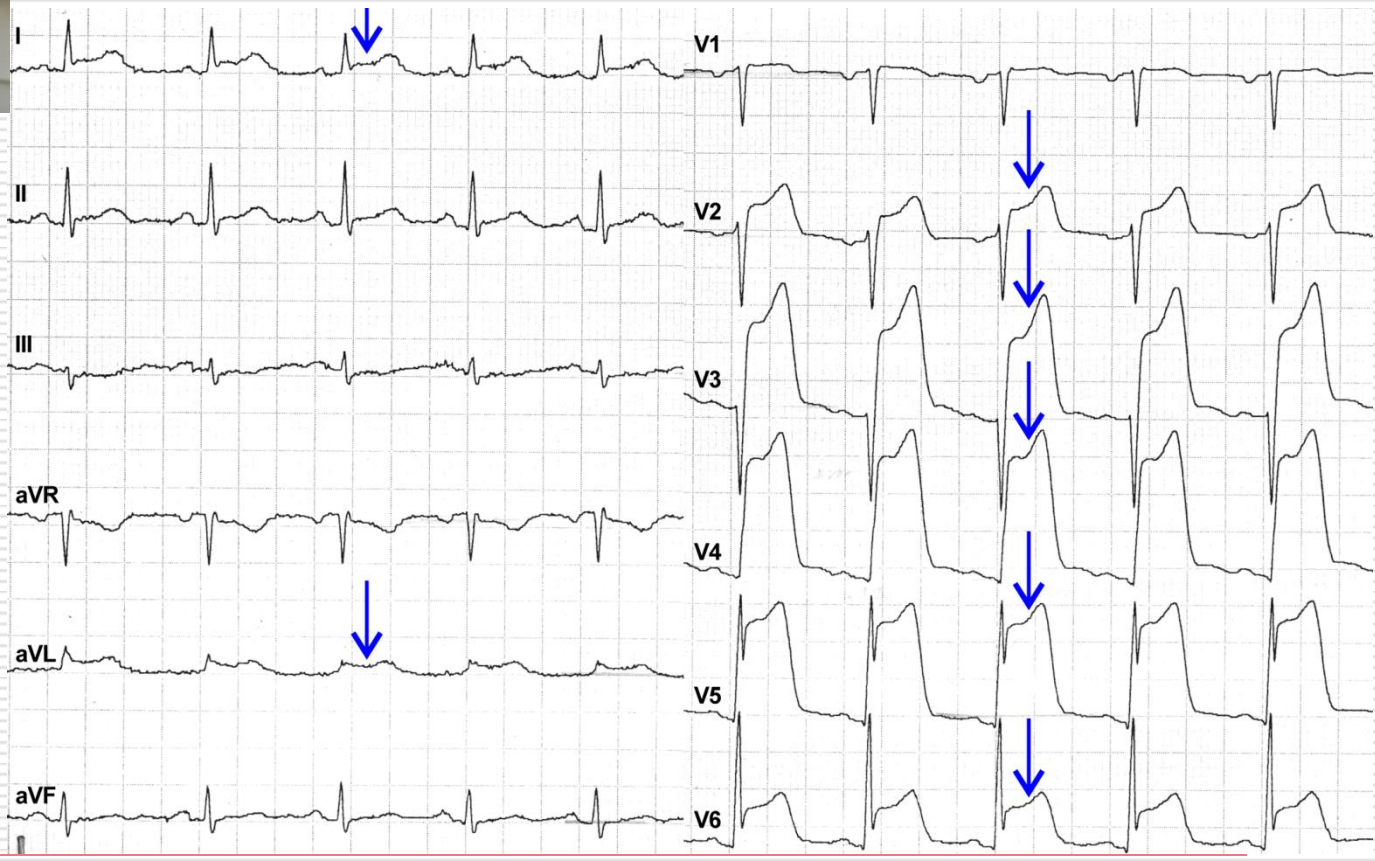
Akutní kardiologie – kde jsme a kam kráčíme?

XXIV. kongres české kardiologické společnosti, Brno – Výstaviště, 15.-18.5.2016

Martin Hutyra

1. interní klinika - kardiologická, Lékařská fakulta a Fakultní nemocnice Olomouc

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC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European Heart Journal (2012) **33**, 2569–2619
doi:10.1093/eurheartj/ehs215

ESC GUIDELINES

ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation

The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC)

Authors/Task Force Members: Ph. Gabriel Steg (Chairperson) (France)*, Stefan K. James (Chairperson) (Sweden)*, Dan Atar (Norway), Luigi P. Badano (Italy), Carina Blömstrom-Lundqvist (Sweden), Michael A. Borger (Germany), Carlo Di Mario (United Kingdom), Kenneth Dickstein (Norway), Gregory Ducrocq (France), Francisco Fernandez-Aviles (Spain), Anthony H. Gershlick (United Kingdom), Pantaleo Giannuzzi (Italy), Sigrun Halvorsen (Norway), Kurt Huber (Austria), Peter Juni (Switzerland), Adnan Kastrati (Germany), Juhani Knuuti (Finland), Mattie J. Lenzen (Netherlands), Kenneth W. Mahaffey (USA), Marco Valgimigli (Italy), Arnoud van 't Hof (Netherlands), Petr Widimsky (Czech Republic), Doron Zahger (Israel)

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PRACTICE GUIDELINE

2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction

A Report of the American College of Cardiology Foundation/
American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Emergency Physicians and Society for Cardiovascular Angiography and Interventions

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CORETVASA 54 (2012) E273–E289
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Guidelines

Summary of the 2012 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevations. Prepared by the Czech Society of Cardiology ☆

Petr Widimský[a,], Petr Kala[b], Richard Rokyta[c]*
[a]Cardiocenter Third Faculty of Medicine, Charles University Prague, Czech Republic
[b]Internal-cardiology department Faculty of Medicine, Masaryk University, Brno, Czech Republic
[c]Department of Cardiology, University Hospital Plzen, Faculty of Medicine Plzen, Charles University, Prague, Czech Republic

Authors of the original ESC guidelines document [1]: Ph. Gabriel Steg and Stefan James on behalf of the ESC Task Force on the management of ST-segment elevation acute myocardial infarction.

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Czech Society of Cardiology

EUROPEAN SOCIETY OF CARDIOLOGY®
ČESKÁ KARDIOLOGICKÁ SPOLEČNOST
THE CZECH SOCIETY OF CARDIOLOGY

European Heart Journal (2012) **33**, 2551–2567
doi:10.1093/eurheartj/ehs184

EXPERT CONSENSUS DOCUMENT

Third universal definition of myocardial infarction

Kristian Thygesen, Joseph S. Alpert, Allan S. Jaffe, Maarten L. Simoons, Bernard R. Chaitman and Harvey D. White: the Writing Group on behalf of the Joint ESC/ACCF/AHA/WHF Task Force for the Universal Definition of Myocardial Infarction

I. INTERNÍ KLINIKA
KARDIOLOGIE
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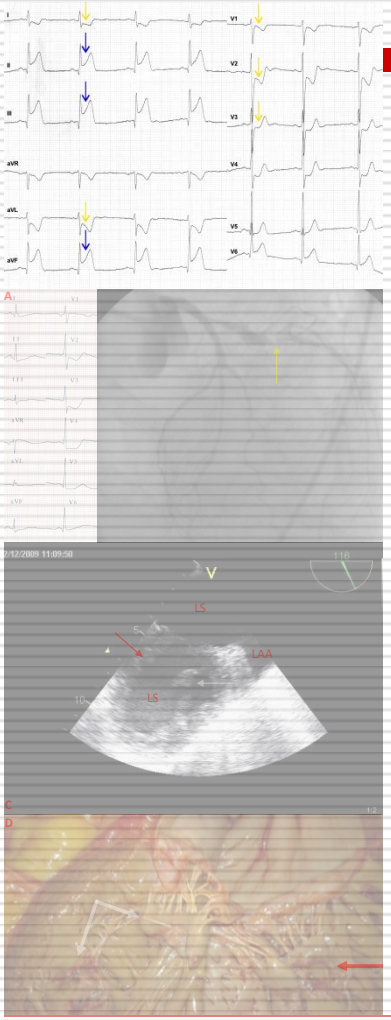
Nová klasifikace ACS



COR ET VASA 55 (2013) E225–E227

Available online at www.sciencedirect.com

SciVerse ScienceDirect

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

ELSEVIER

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Expert Consensus Statement

Acute coronary syndromes with ongoing myocardial ischemia (ACS with OMI) versus acute coronary syndromes without ongoing ischemia (ACS without OMI)

The new classification of acute coronary syndromes should replace old classification based on ST segment elevation presence or absence—Expert consensus statement of the Czech Society of Cardiology

Petr Widimský[a,*], Richard Rokyta[b], Josef Štěrbák[c], Jan Bělohlávek[d], Pavel Červinka[e], Petr Kala[f], on behalf of the Czech Society of Cardiology[1]

A *The currently used classification of acute coronary asyndromes*

First medical contact diagnosis		Final (discharge) diagnosis		
STEMI	Non-STE ACS	Q-wave MI	Non-Q wave MI	Unstable angina

B *The proposed new classification of acute coronary syndromes*

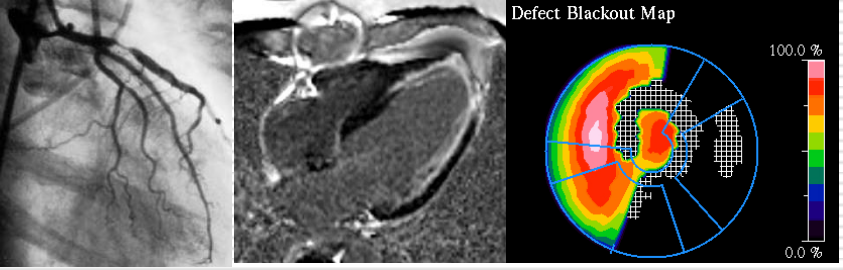
First medical contact diagnosis		Final (discharge) diagnosis		
ACS with OMI	ACS without OMI	Q-wave MI	Non-Q wave MI	Unstable angina

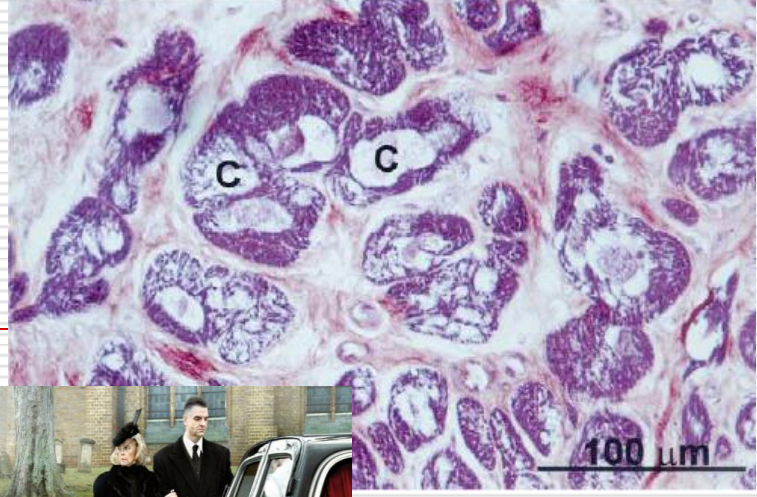
(a) Acute coronary syndrome with ongoing myocardial ischemia is defined as ongoing (or recurrent) *clinical signs of acute myocardial ischemia* (i.e. persistent chest pain and/or dyspnea at rest) **plus** *at least one* of the following:

(1) ST segment elevations in ≥2 consecutive ECG leads (≥2 mm for leads V2–V3, ≥0,5 mm for leads V7–V9 and ≥1 mm for other leads);
(2) new onset bundle branch block (right or left);
(3) persistent ST segment depressions in ≥2 consecutive ECG leads (≥2 mm for chest leads and ≥1 mm for extremity leads);
(4) cardiogenic shock or "pre-shock" type of hemodynamic instability (low-to-normal blood pressure+tachycardia +cool extremities) due to suspected ischemia;
(5) malignant arrhythmias including resuscitated cardiac arrest with return of spontaneous circulation;
(6) clinical signs of acute heart failure (Killip II–IV); and
(7) new onset of a wall motion abnormality on cardiac imaging.

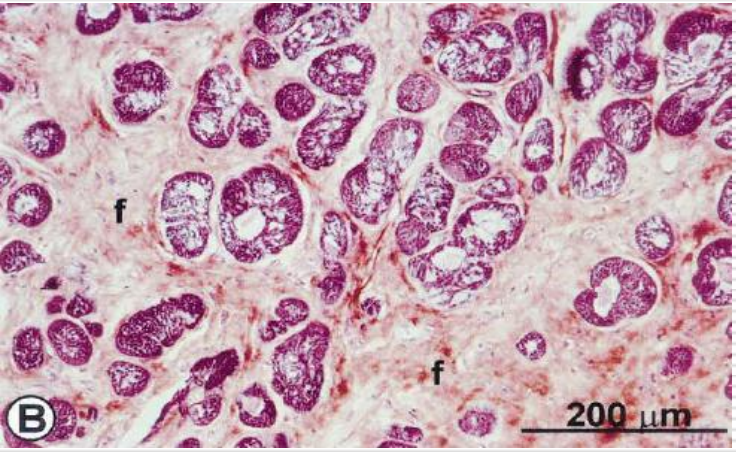
It is important to keep in mind, that isolated findings listed under 1–7 above (e.g. malignant arrhythmias without any clinical or ECG sign of acute ischemia) do not fulfill this definition. The high clinical suspicion for acute myocardial infarction is important. Direct transport to cathlab (bypassing any other location—e.g. intensive care unit or emergency room) is always required in groups 1–4. Patients from groups 5–7 should also be transported to a non-stop (24/7) primary PCI facility (either directly to cath-lab or they may be primarily admitted to the intensive cardiac care unit with cath-lab immediately available).

(b) *Acute coronary syndrome without ongoing myocardial ischemia* includes all other acute coronary syndromes. Specifically, these are the patients with unstable angina and with small acute myocardial infarction (troponin elevation) not having the above mentioned signs of ongoing ischemia at the time of first medical contact.





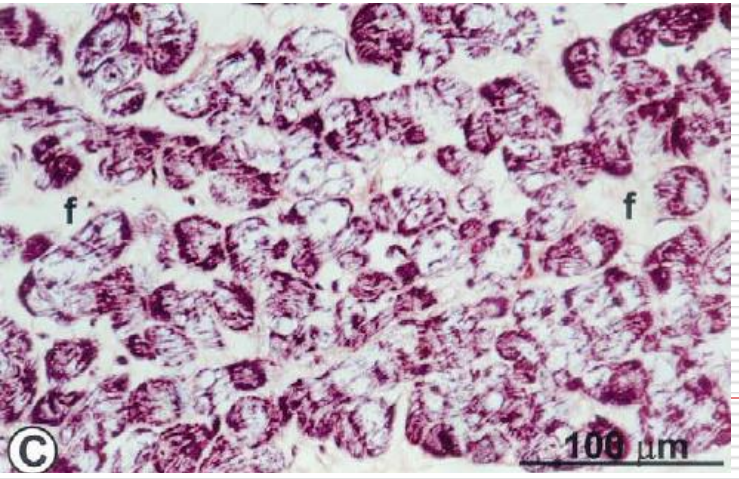
Norma

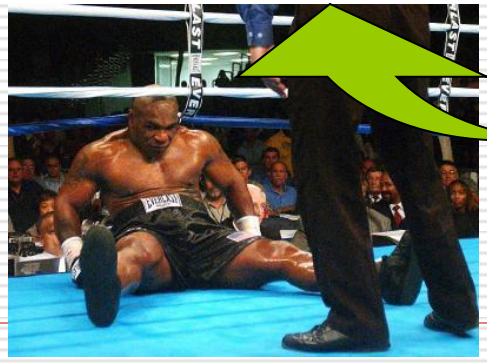


Jizva

Stunning

Hibernace





Sheppard, Nicholas et al. The histology of viable and hibernating myocardium in relation to imaging characteristics. J. Am. Coll. Cardiol. 2002;39;428-435

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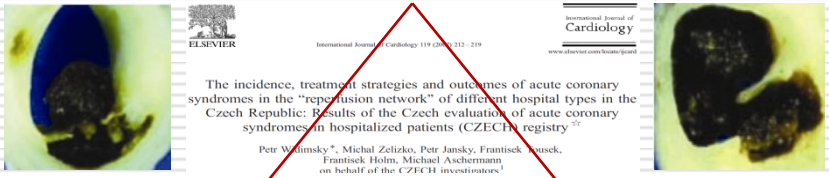
AKS – epidemiologie a důsledky

Akutní koronární syndromy

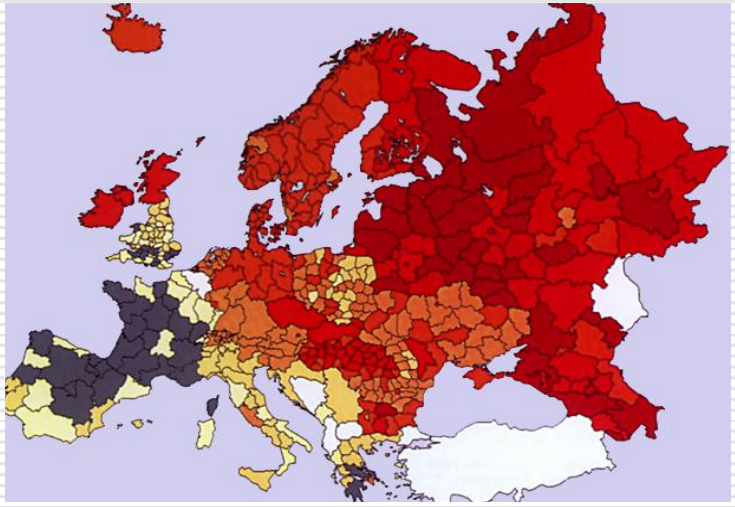
I: *3248/1 mil./rok* **M:** *5.1%*

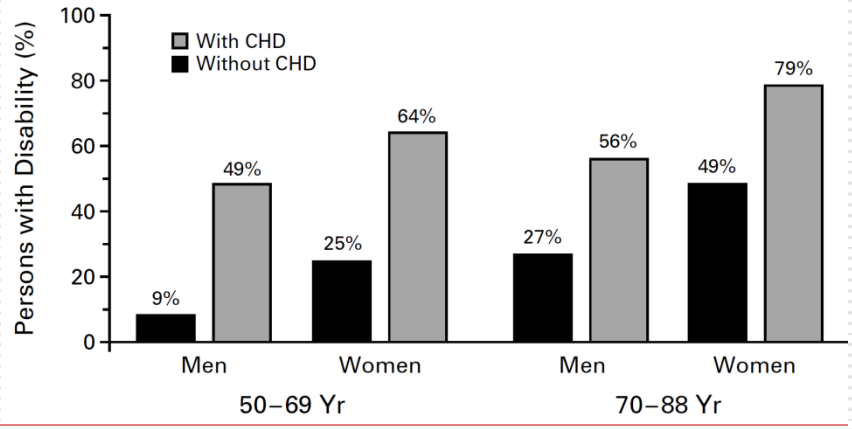


NAP/NSTEMI | **STEMI**

2587/1 mil./rok *661/1 mil./rok*

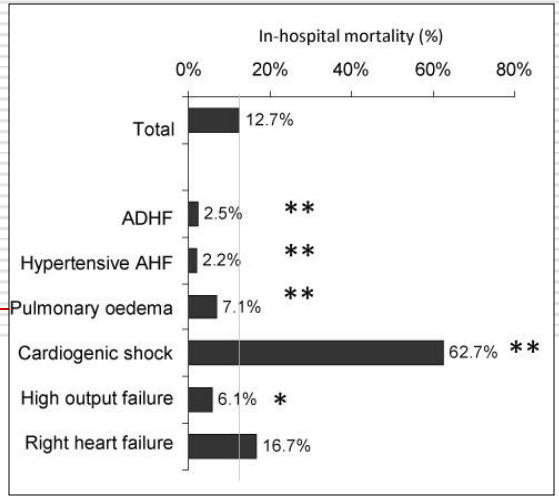
M: *Q-IM 10%, non-Q IM 4.4%, NAP 0.9%*

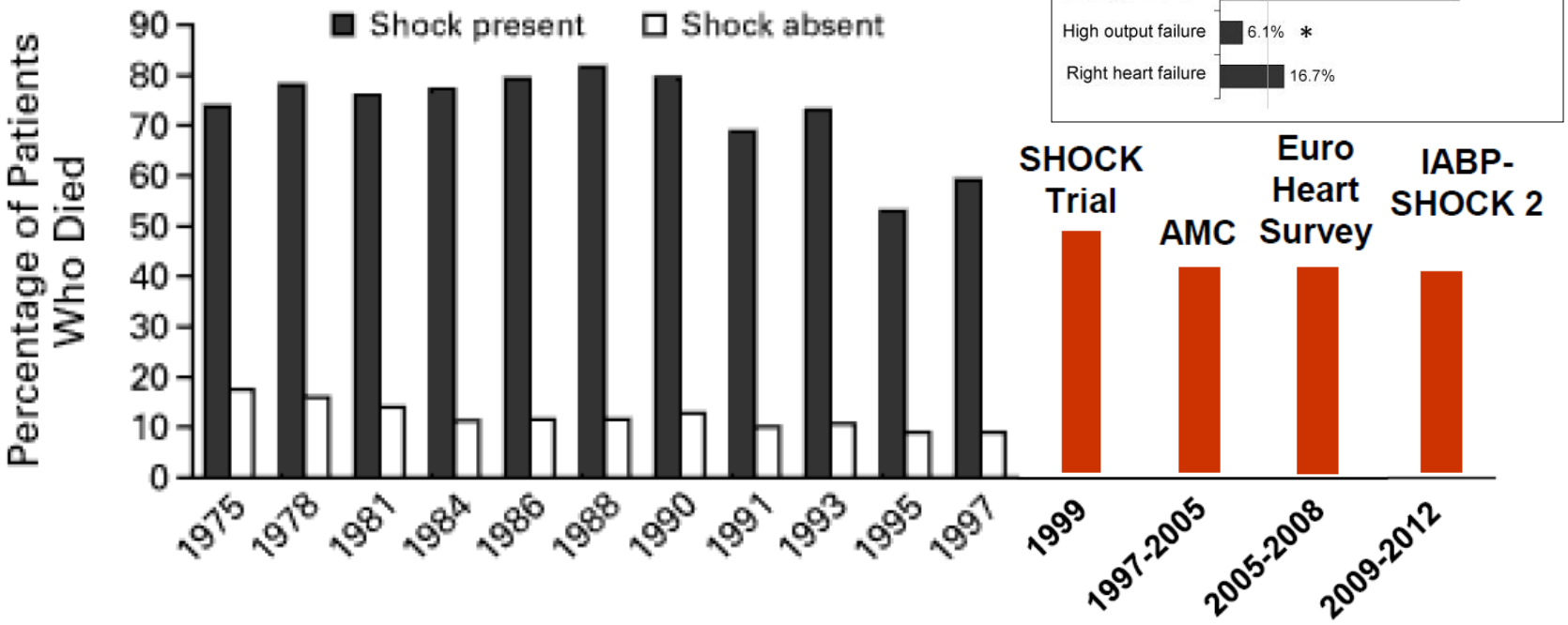


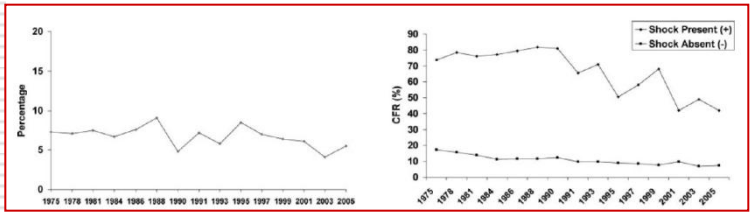


P. Widimsky et al. International Journal of Cardiology 119 (2007) 212–219
Sans S et al. Eur Heart J. 1997;18:1231-1249
Ades PA. NEJM, Vol. 345, No. 12, September 20, 2001
Gheorghiade et al. Circulation. 2006;114:1202-1213

Mortalita KG šoku







Thrombolysis

Primary PCI ↑

IABP↑

Henriques JPS, ESC 2012
Spinar *et al. Critical Care* 2011 **15**:R291 doi:10.1186/cc10584

Incidence ruptur v současnosti

European Heart Journal (2010) **31**, 1449–1456
doi:10.1093/eurheartj/ehq061

CLINICAL RESEARCH
Coronary heart disease

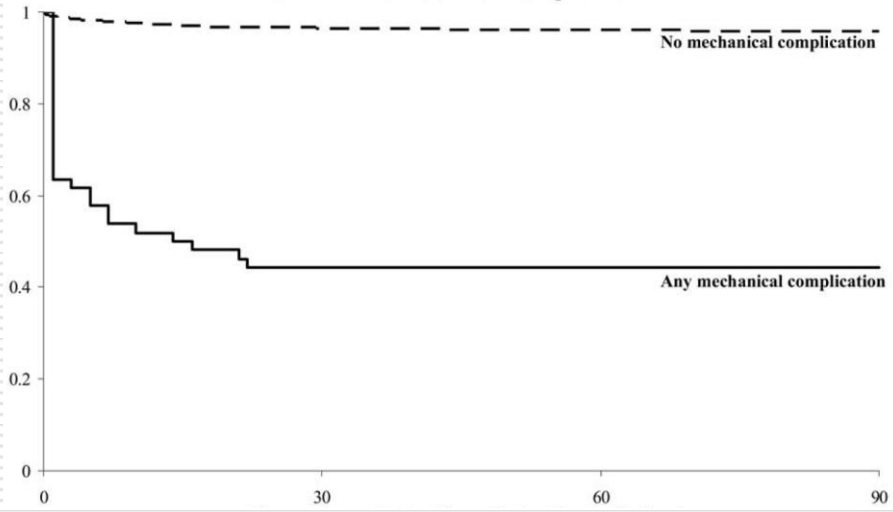
Factors related to heart rupture in acute coronary syndromes in the Global Registry of Acute Coronary Events

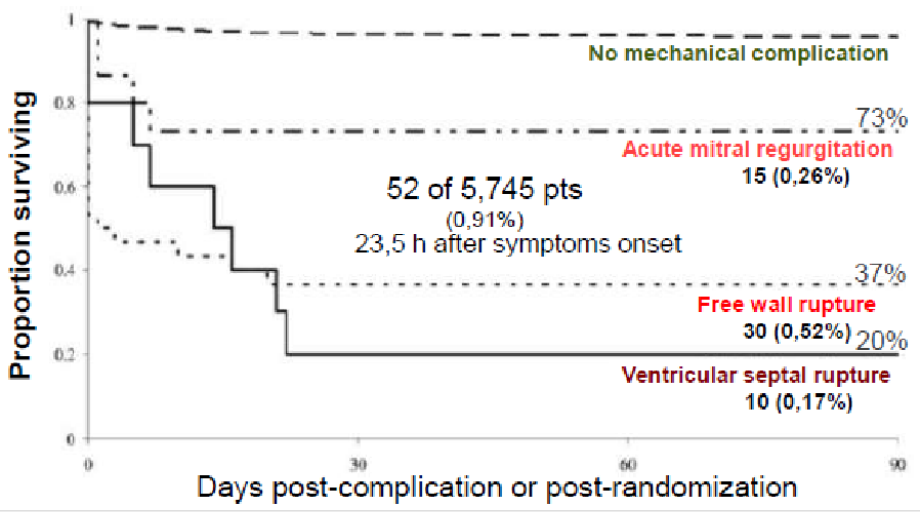
José López-Sendón[1]*, Enrique P. Gurfinkel[2], Esteban Lopez de Sa[1], Giancarlo Agnelli[3], Joel M. Gore[4], Phillippe Gabriel Steg[5], Kim A. Eagle[6], Jose Ruiz Cantador[1], Gordon Fitzgerald[4], and Christopher B. Granger[7] for the Global Registry of Acute Coronary Events (GRACE) Investigators

RVS + RKS: 0,45 % celkově (n > 60000), 0,9 % u STEMI
STEMI 1:111 (66% léčených reperfuzí), NSTEMI 1:588, NAP 1:400 **(!)**

Přežívání po STEMI s mechanickou komplikací

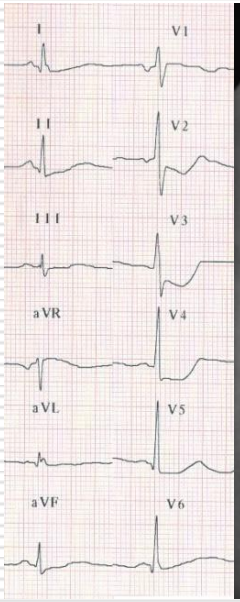
	No Mechanical Complications (n = 5,693)	Cardiac FWR (n = 30)	Acute MR (n = 15)	VSR (n = 10)
Primary angioplasty	5,331 (94%)	25 (83%)	12 (80%)	8 (80%)
In-hospital survival	5,545 (97%)	13* (43%)	11* (73%)	6* (60%)
Further procedure	691 (12%)	13* (43%)	7* (47%)	5* (50%)
30-d survival	5,491 (96%)	11* (37%)	11* (73%)	2* (20%)
90-d survival	5,438 (96%)	11* (37%)	11* (73%)	2* (20%)
Patients with cardiogenic shock/heart failure	427	8	11	6
30-d survival	324 (76%)	5 (63%)	7 (64%)	1* (17%)
90-d survival	305 (71%)	5 (63%)	7 (64%)	1* (17%)

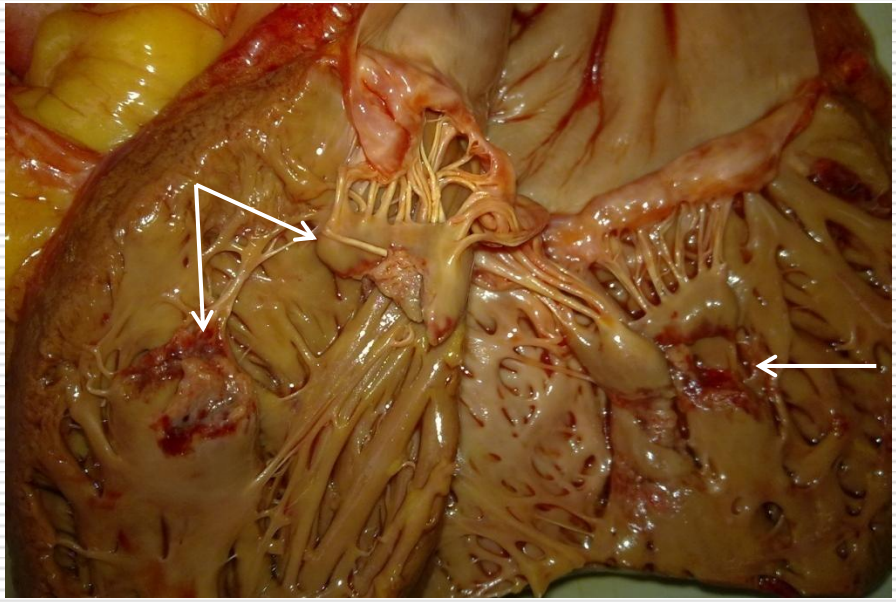




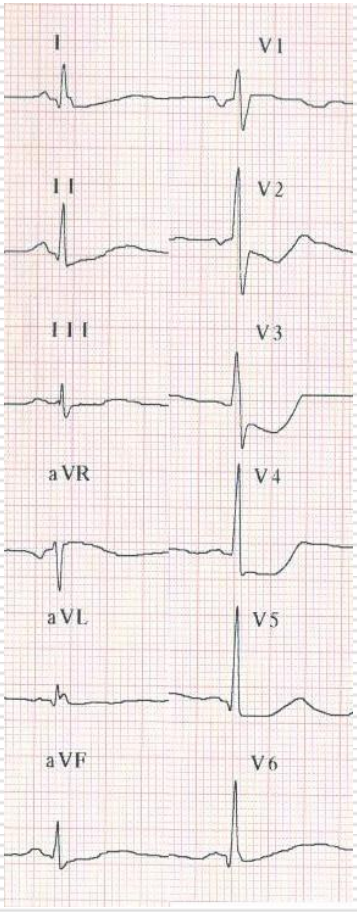
French et. al., Am J Cardiol 2010

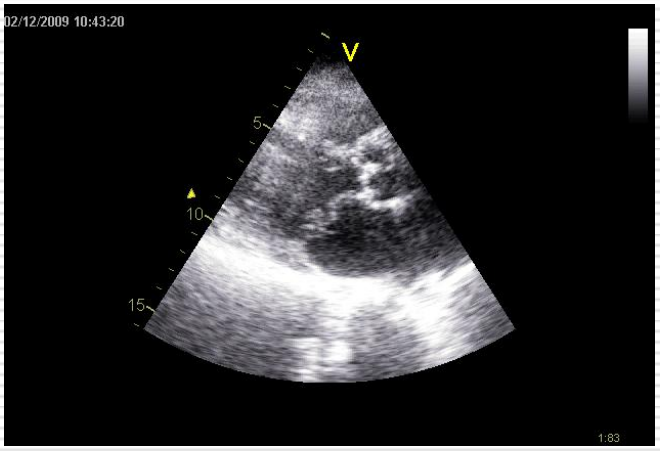
Ruptura papilárního svalu

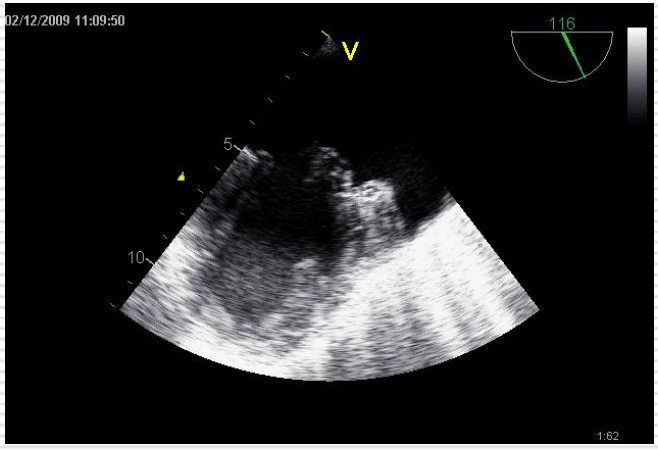


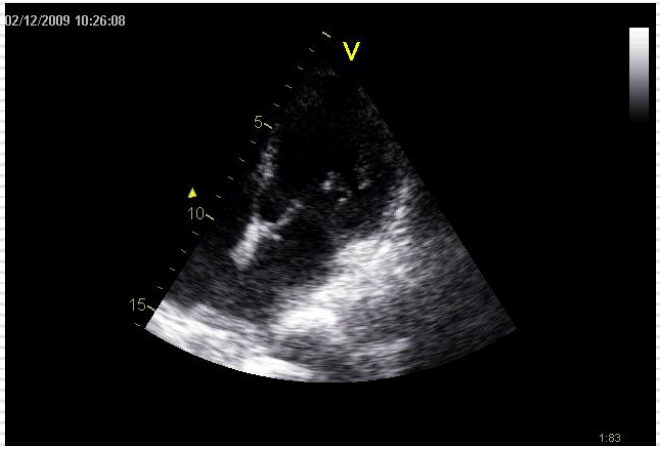


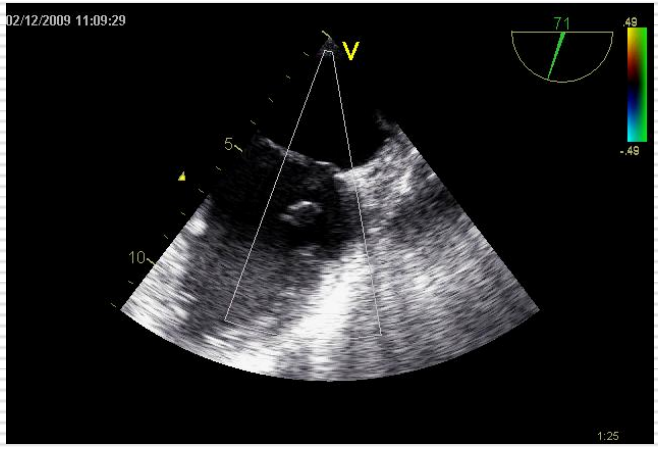
Ruptura papilárního svalu



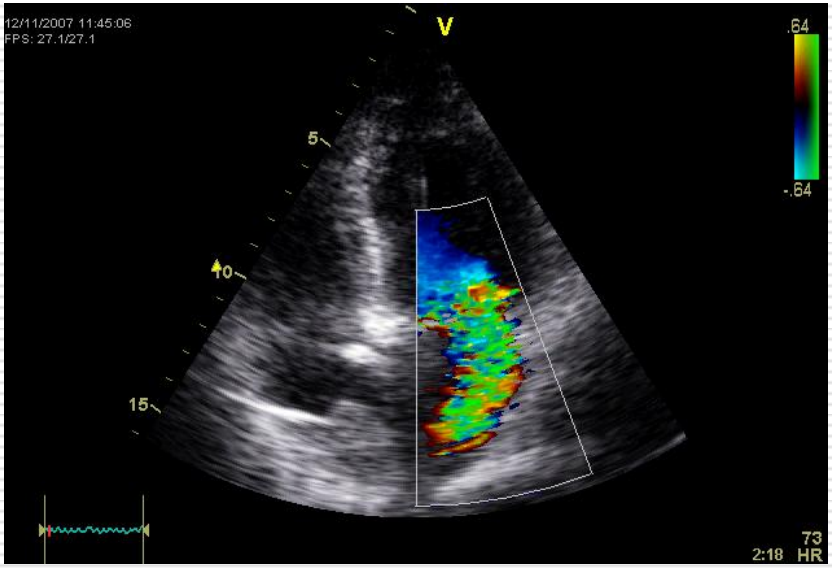








Akutní IMR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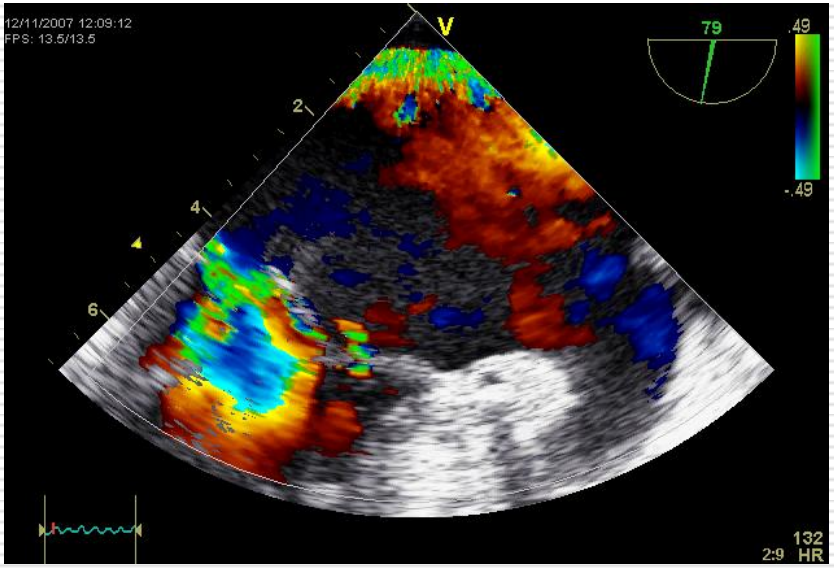
2:18 HR


12/11/2007 12:09:12
FPS: 13.5/13.5
V
79
.49
-.49
2
4
6
132
2:9 HR

European Heart Journal (2010) 31, 2996–3005
doi:10.1093/eurheartj/ehq411

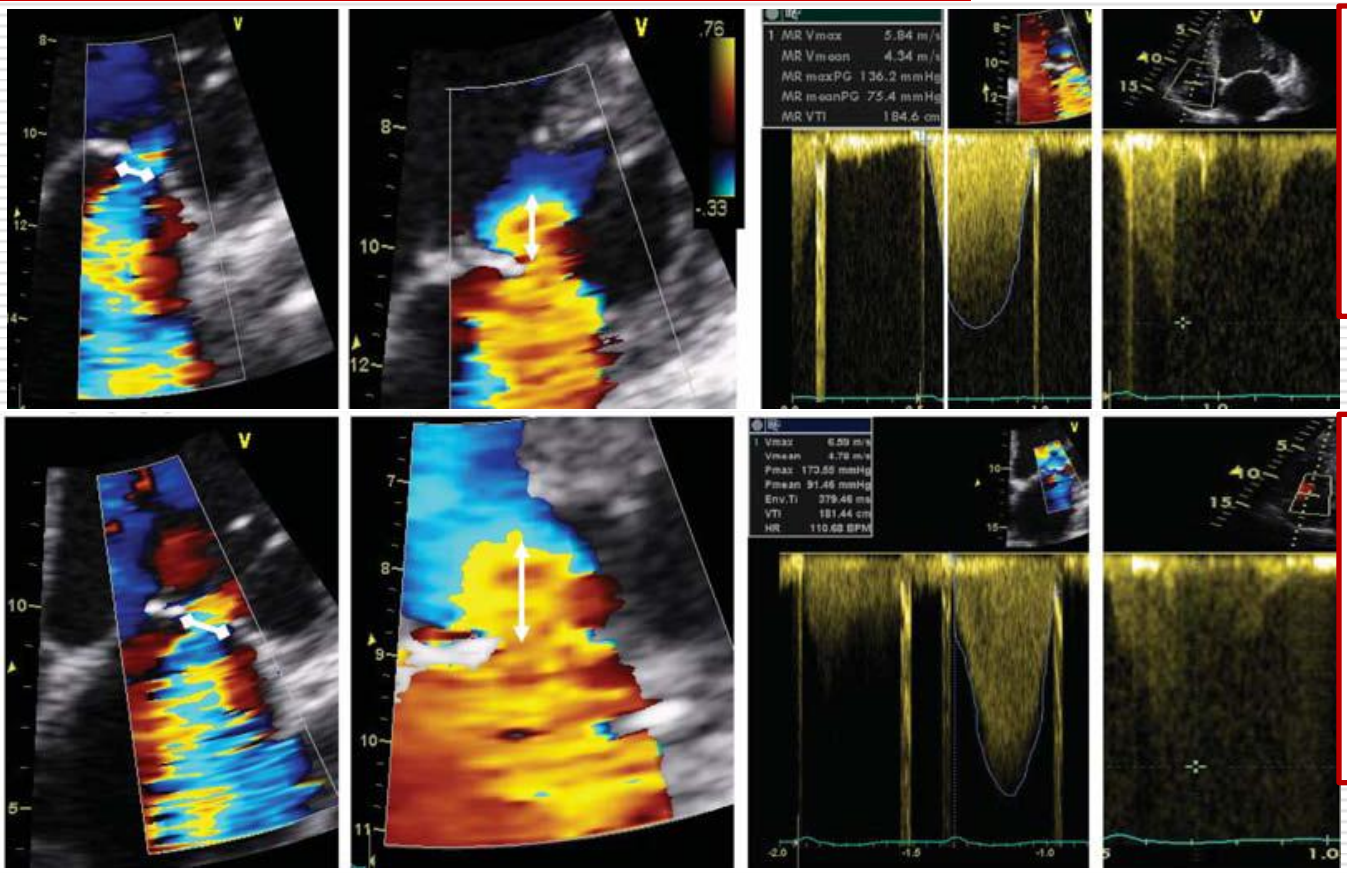
REVIEW

Frontiers in cardiovascular medicine

Ischaemic mitral regurgitation: pathophysiology, outcomes and the conundrum of treatment

Luc A. Piérard[1]* and Blase A. Carabello[2]

IMR



KLIDOVÉ VYŠ.
VC 5 mm
TR 36 mmHg
ERO 0,22 cm^2
RV 40 ml

ZÁTĚŽ
VC 7 mm
TR 77 mmHg
ERO 0,38 cm^2
(↑0,16 cm^2)
RV 69 ml

Pierard L. et al. Ischaemic mitral regurgitation: pathophysiology, outcomes and the conundrum of treatmenteart failure and dynamic functional mitral regurgitation. European Heart Journal (2010) 31, 2996–3005.

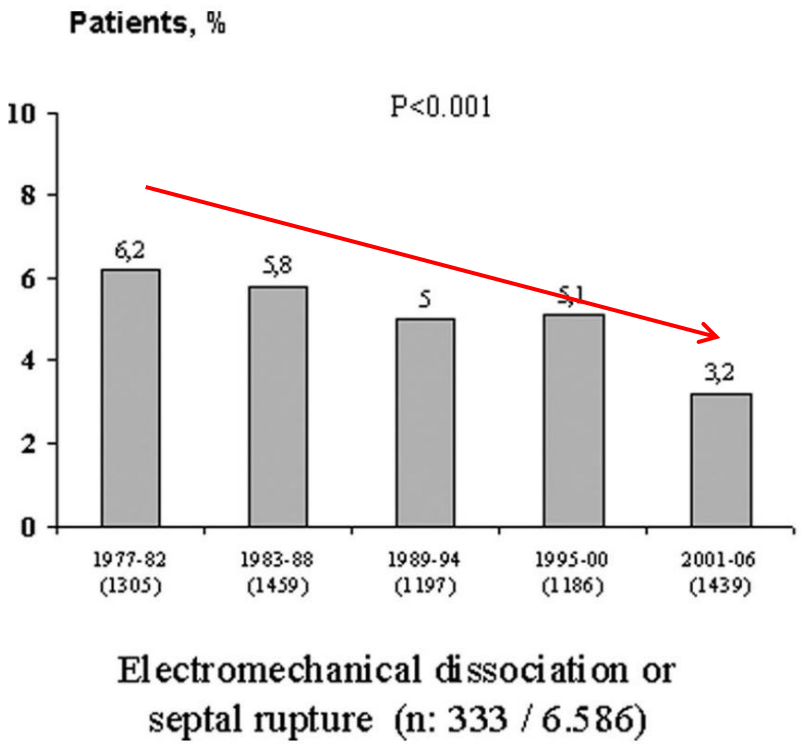
Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association

Changes in Hospital Mortality Rates in 425 Patients With Acute ST-Elevation Myocardial Infarction and Cardiac Rupture Over a 30-Year Period
Jaume Figueras, Oscar Alcalde, José A. Barrabés, Vicens Serra, Joan Alguersuari, Josefa Cortadellas and Rosa-Maria Lidón

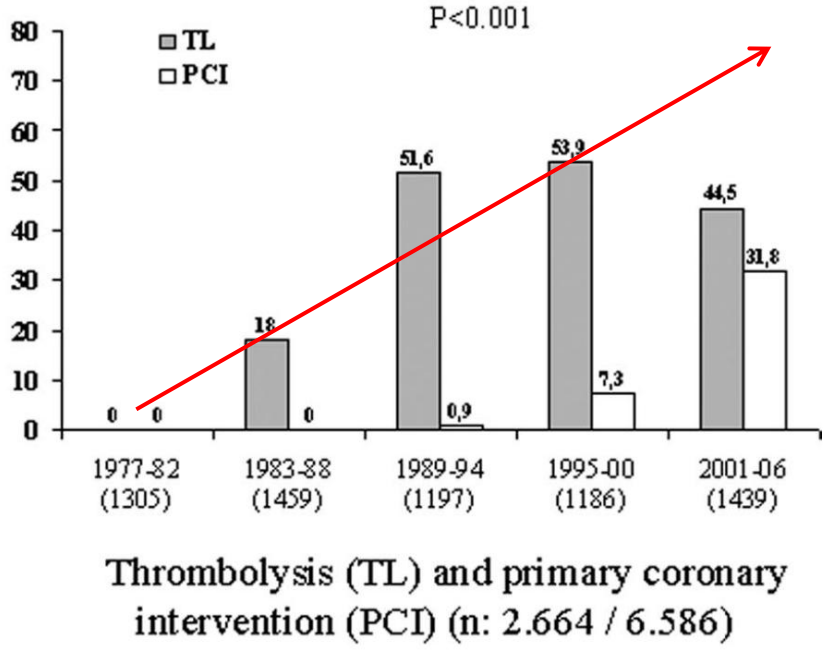
Circulation. 2008;118:2783-2789; originally published online December 8, 2008;
doi: 10.1161/CIRCULATIONAHA.108.776690
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0009-7322. Online ISSN: 1524-4539

Efekt reperfuze



Electromechanical dissociation or septal rupture (n: 333 / 6.586)

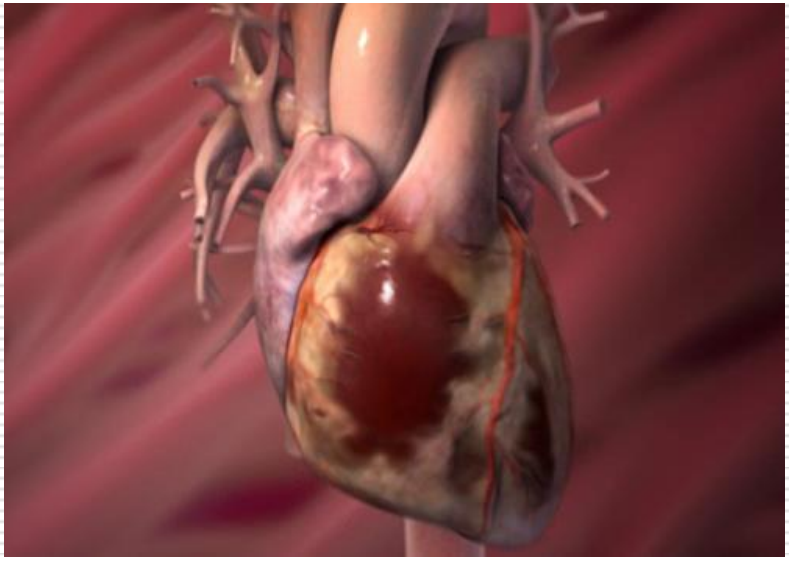


Thrombolysis (TL) and primary coronary intervention (PCI) (n: 2.664 / 6.586)

TTE prospektivní observační studie: [1]**1992** 2,6% VSR vs. [2]**2008** 1,4% VSR+FWR

[1]Lopez-Sendon J, Gonzalez A, Lopez de Sa E, et al. Diagnosis of subacute ventricular wall rupture after acute myocardial infarction: sensitivity and specificity of clinical, hemodynamic and echocardiographic criteria. J Am Coll Cardiol 1992;19:1145–1153.
[2]Gueret P, Khalife K, Jobic Y, et al. Echocardiographic assessment of the incidence of mechanical complications during the early phase of myocardial infarction in the reperfusion era: a French multicentre prospective registry. Arch Cardiovasc Dis 2008;101:41–47.

KARDIOGENNÍ ŠOK



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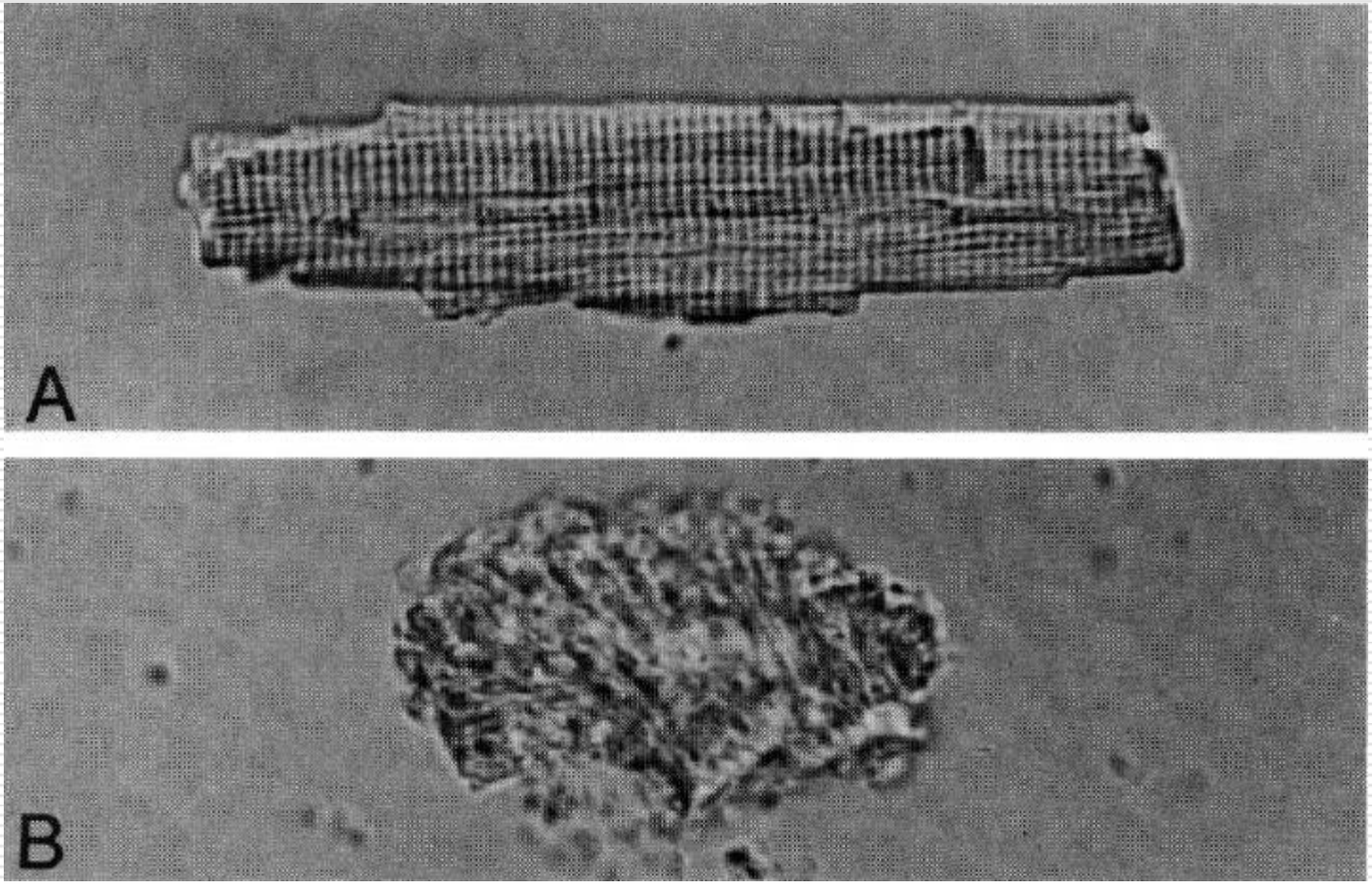
Před expozicí noradrenalinem



Po expozici noradrenalinem

SYMPOSIUM
Myocardial Infarction 1972
(Part 6)

Surgery for Complications of Acute Myocardial Infarction

By ELDRED D. MUNDTH, M.D., MORTIMER J. BUCKLEY, M.D., WILLARD M. DAGGETT, M.D., CHARLES A. SANDERS, M.D., AND W. GERALD AUSTEN, M.D.

Therapeutic Measures for Treatment of Cardiogenic Shock

1.	Supportive	Oxygen, morphine, blood volume adjustment, correction or acidosis
2.	Electrical pacing technics	Atrial or sequential atrioventricular pacing
3.	Pharmacologic	Antiarrhythmic drugs, catecholamines, digitalis
4.	Circulatory assistance	

Circulation. 1972;45:1279-1291
doi: 10.1161/01.CIR.45.6.1279
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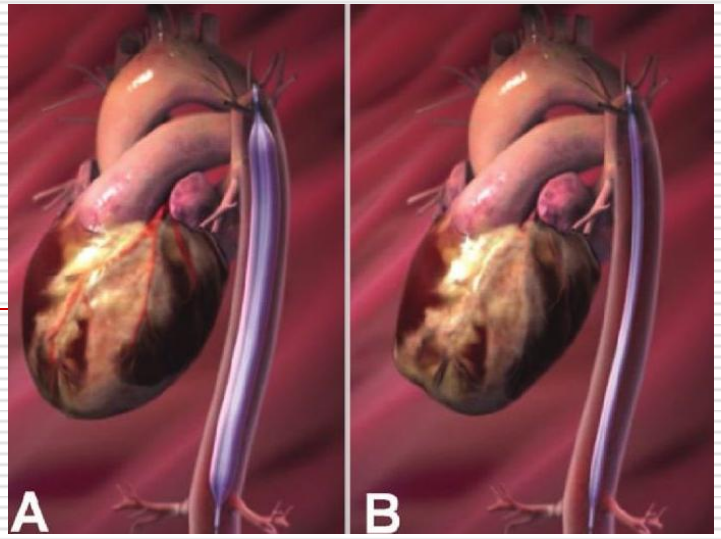


1962 ANIMÁLNÍ MODEL

Moulopoulos et al, Am Heart J 1962;63:669-675

1968 1. KLINICKÉ POUŽITÍ

Kantrowitz et al, JAMA 1968;203:135-140

1973 PRŮKAZ HEMODYNAMICKÉHO EFEKTU

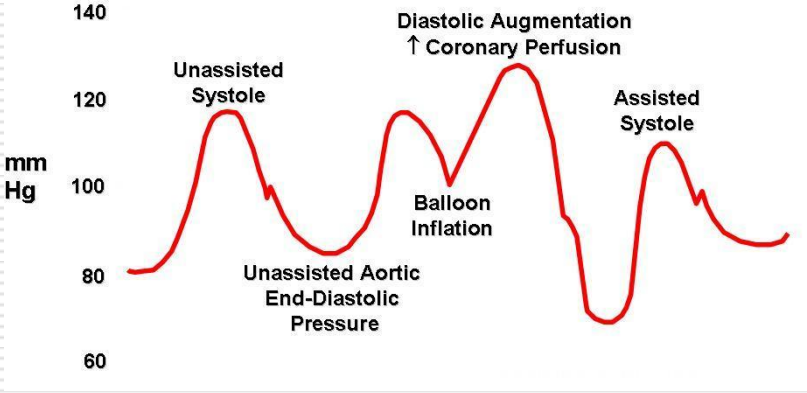
Scheidt et al, NEJM 1973;288:979-984

> 40 LET > 1.000.000 LÉČENÝCH

Ferguson et al, JACC 2001;38:1456-1462

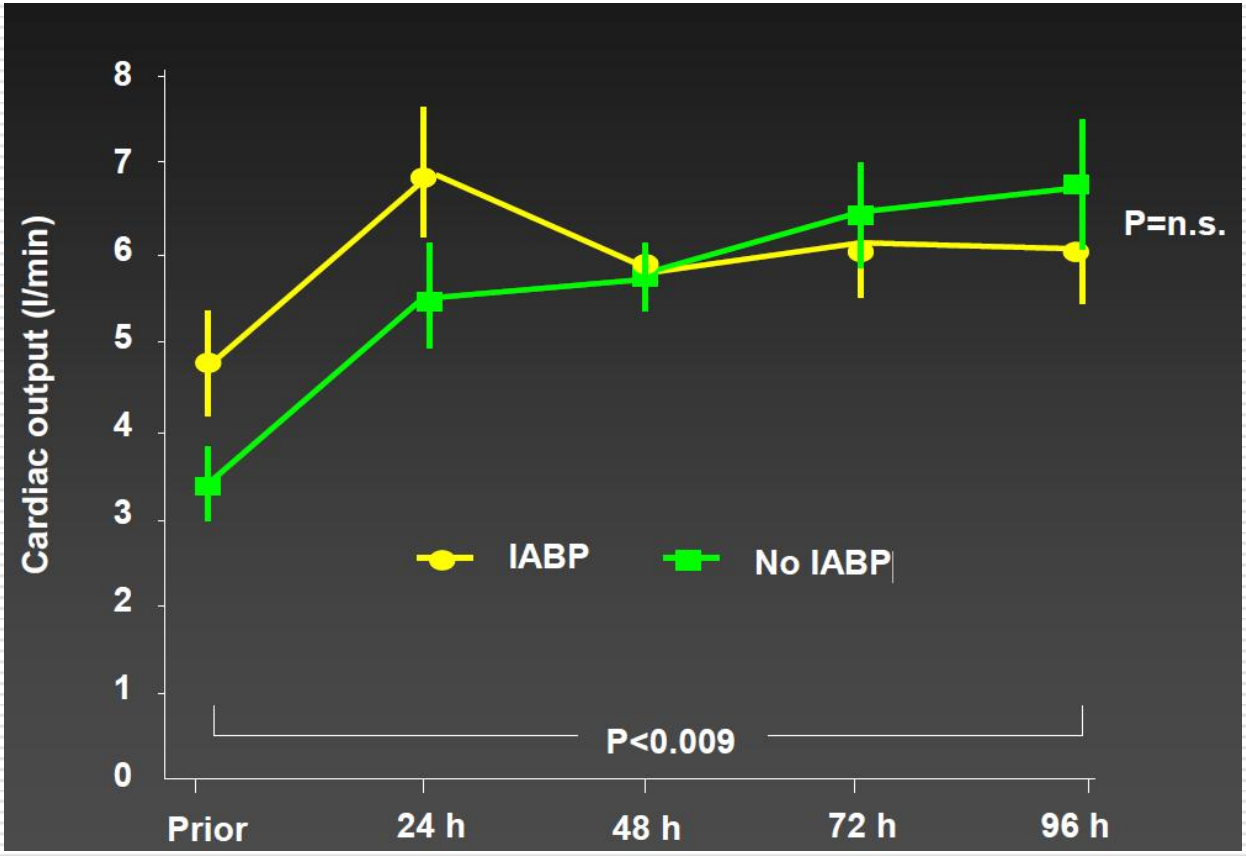
IABP ovlivnění hemodynamiky u kardiogenního šoku *(n=78)*

	Pre IABP	Post IABP	*p*
TF (1/min)	110±24	103±21	NS
SAP (mmHg)	76±22	57±17	< 0.001
DAP (mmHg)	53±12	83±19	< 0.001
MAP (mmHg)	**62±18**	**64±21**	**NS**
CO (l/min)	**2.4**	**2.9**	**< 0.01**



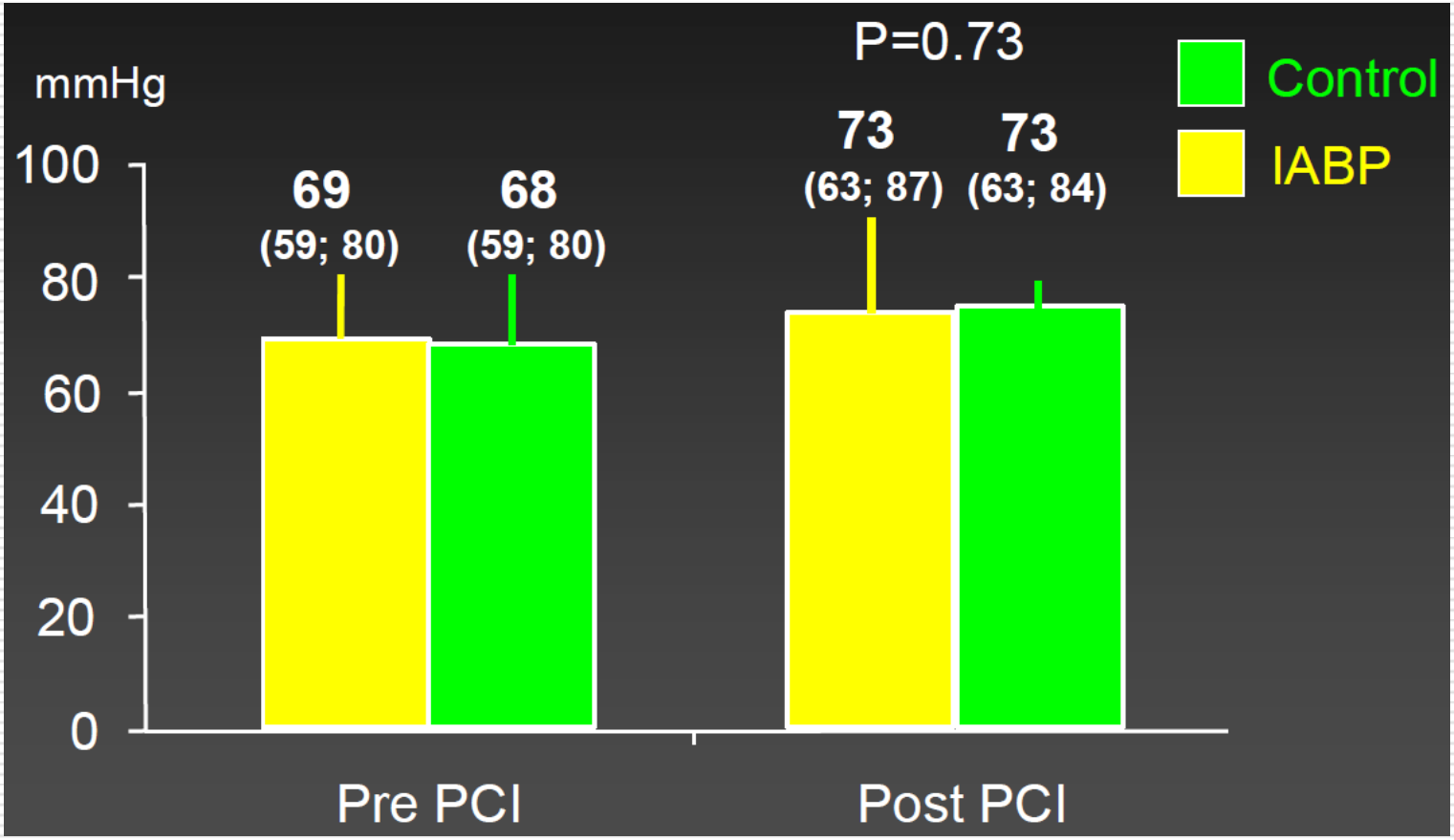
Scheidt et al. NEJM 1973;288:979-984

IABP vs. kontroly u kardiogenního šoku *(n=40)*



Prondzinsky et al. Shock 2012:37:378-384

IABP ovlivnění MAP u kardiogenního šoku



Thiele et al. NEJM 2012;367:1287-1296

European Heart Journal (2009) 30, 459–468
doi:10.1093/eurheartj/ehn602

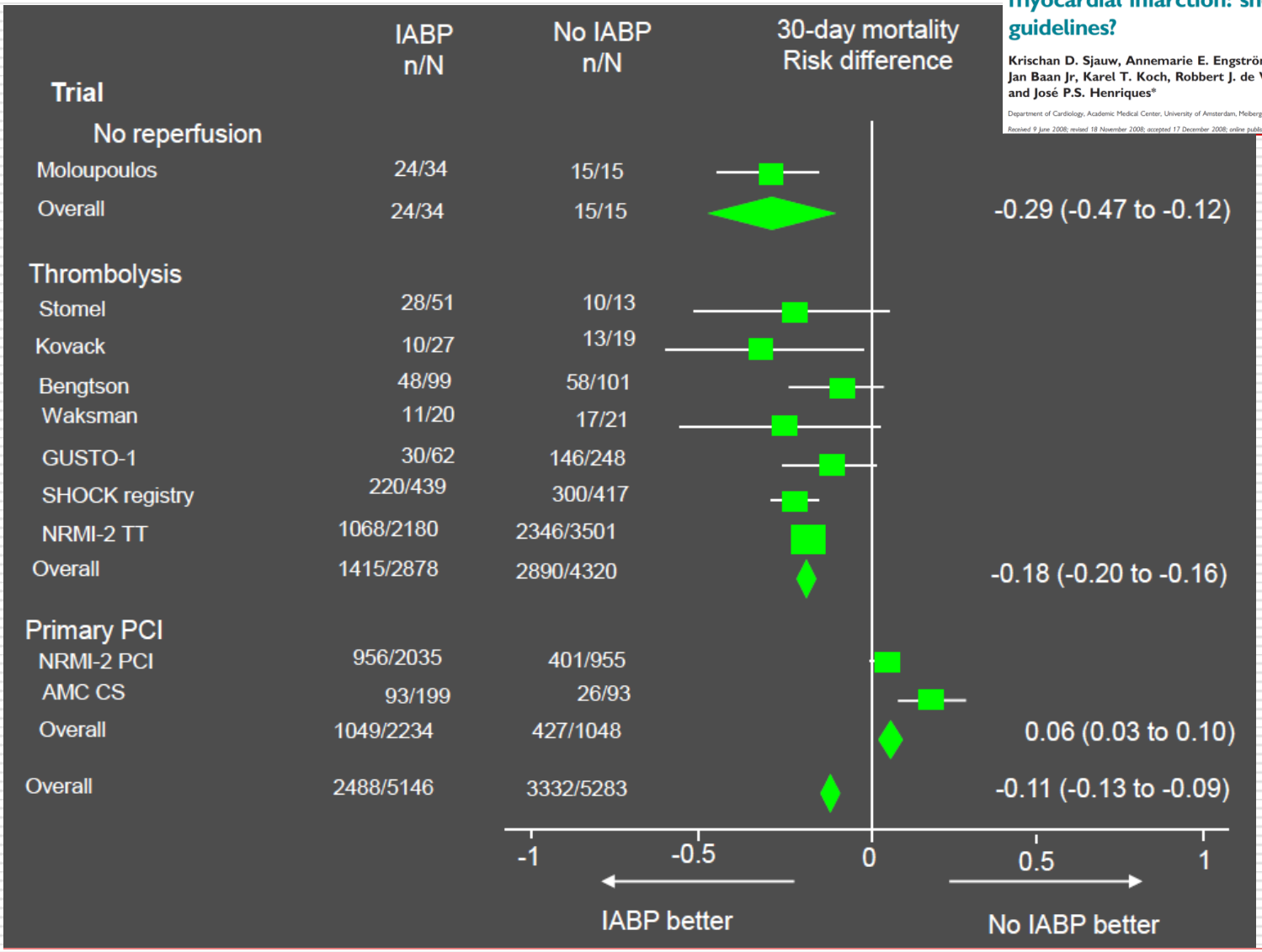
CLINICAL RESEARCH
Coronary heart disease

A systematic review and meta-analysis of intra-aortic balloon pump therapy in ST-elevation myocardial infarction: should we change the guidelines?

Krischan D. Sjauw, Annemarie E. Engström, Marije M. Vis, René J. van der Schaaf, Jan Baan Jr, Karel T. Koch, Robbert J. de Winter, Jan J. Piek, Jan G.P. Tijssen, and José P.S. Henriques*

Department of Cardiology, Academic Medical Center, University of Amsterdam, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

Received 9 June 2008; revised 18 November 2008; accepted 17 December 2008; online publish-ahead-of-print 23 January 2009



Sjauw et al. Eur Heart J 2009;30:459-468

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

ACC/AHA

Class IB

ESC

Class IC

Van de Werf et al. Eur Heart J 2008;29:2909-2945
Wijns et al. Eur Heart J 2010;31:2501-2555
Antman et al. Circulation 2004;110:82-292

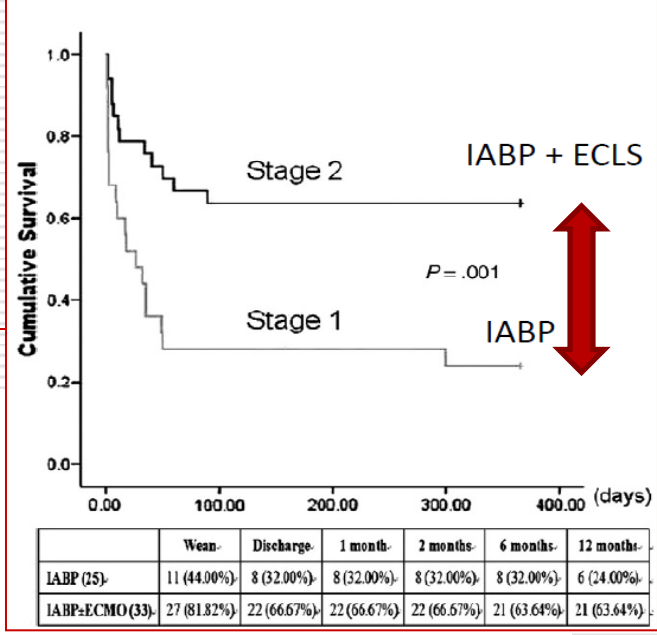
- single centre, retrospektivní
- AIM Killip IV, refrakterní KG šok
- **2004–2006 IABP vs. 2007–2009 IABP + ECLS**

ECMO asistovaná PCI v.s. IABP

Table 1 Demographic characteristics and disease severity

	Only IABP-assisted PCI n = 25	IABP- and/or ECMO-assisted PCI n = 33	*P*
Demographic characteristics			
Age (y)	70.12 ± 16.97	74.08 ± 12.17	.46
Sex (male) (n; %)	(16; 64%)	(28; 85%)	.12
Body weight (kg)	67.85 ± 11.72	62.05 ± 11.91	.124
LV ejection fraction (%)	39 ± 14	38 ± 10	.912
STEMI (n; %)	(11; 44%)	(18; 54%)	.596
Non-STEMI (n; %)	(14; 56%)	(15; 45%)	.596
IABP (n; %)	(25; 100%)	(31; 93%)	1.000
APACHE score	22.80 ± 8.06	23.27 ± 7.27	.887
Culprit lesion involved			
Left main coronary artery (n; %)	(5; 20%)	(4; 12%)	.479
Left anterior descending artery (n; %)	(19; 76%)	(20; 60%)	.266
Left circumflex artery (n; %)	(7; 28%)	(5; 15%)	.329
Right coronary artery (n; %)	(9; 36%)	(8; 24%)	.390
Biochemical analysis			
Peak CK (IU/L)	4336.28 ± 5916.98	4385.58 ± 5027.14	.643
Peak CK-MB (U/L)	231.35 ± 215.70	288.24 ± 215.16	.3

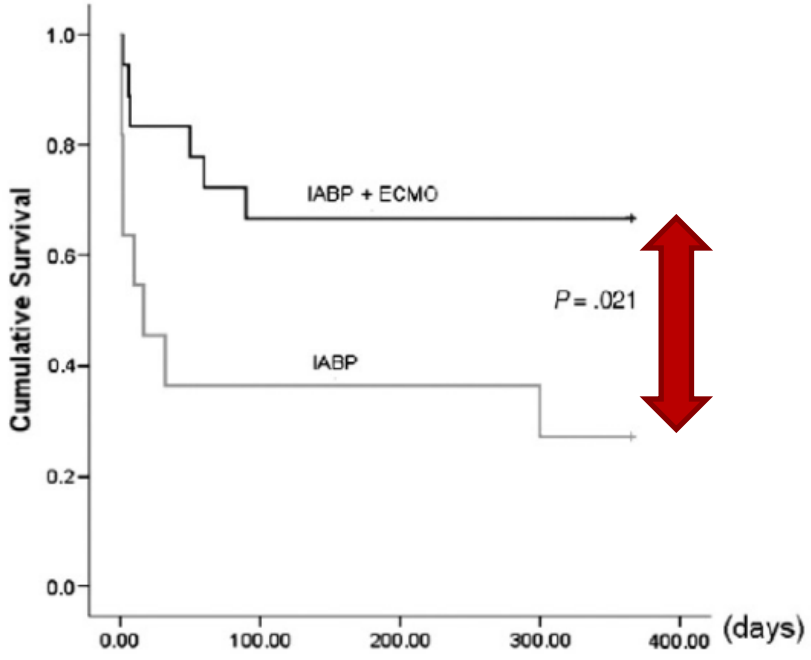
Tsao et al. Journal of Critical Care 2012



	Wean	Discharge	1 month	2 months	6 months	12 months
IABP (25)	11 (44.00%)	8 (32.00%)	8 (32.00%)	8 (32.00%)	8 (32.00%)	6 (24.00%)
IABP±ECMO (33)	27 (81.82%)	22 (66.67%)	22 (66.67%)	22 (66.67%)	21 (63.64%)	21 (63.64%)

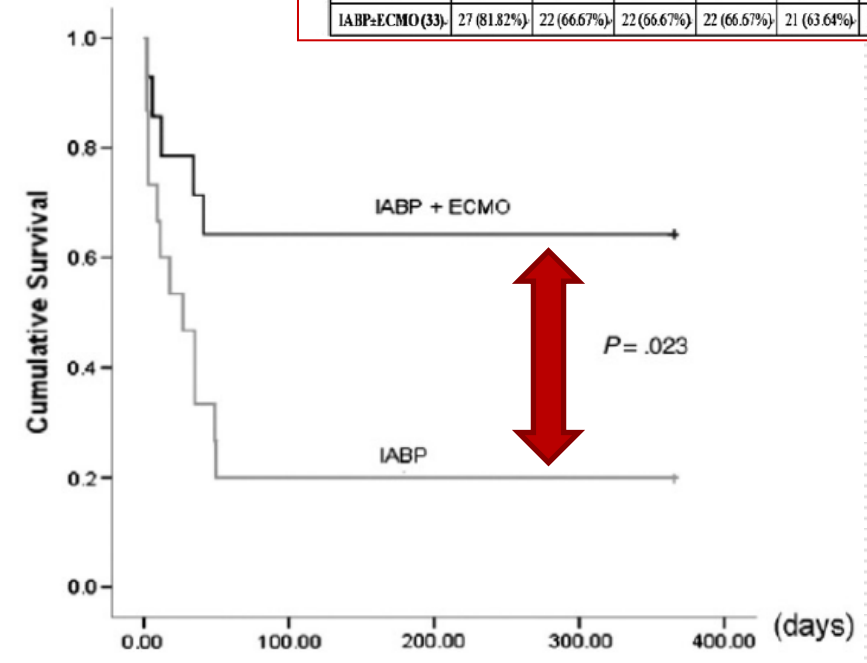
STEMI

C



NSTEMI

D



Tsao et al. Journal of Critical Care 2012

Original Article

Intraaortic Balloon Support for Myocardial Infarction with Cardiogenic Shock

Holger Thiele, M.D., Uwe Zeymer, M.D., Franz-Josef Neumann, M.D., Miroslaw Ferenc, M.D., Hans-Georg Olbrich, M.D., Jörg Hausleiter, M.D., Gert Richardt, M.D., Marcus Hennersdorf, M.D., Klaus Empen, M.D., Georg Fuernau, M.D., Steffen Desch, M.D., Ingo Eitel, M.D., Rainer Hambrecht, M.D., Jörg Fuhrmann, M.D., Michael Böhm, M.D., Henning Ebelt, M.D., Steffen Schneider, Ph.D., Gerhard Schuler, M.D., Karl Werdan, M.D., for the IABP-SHOCK II Trial Investigators

N Engl J Med
Volume 367(14):1287-1296
October 4, 2012

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 4, 2012 VOL. 367 NO. 14

Intraaortic Balloon Support for Myocardial Infarction with Cardiogenic Shock

Table 1. Baseline Characteristics of the Patients.*

Characteristic	IABP (N=301)	Control (N=299)
Age — yr		
Median	70	69
Interquartile range	58–78	58–76
Male sex — no. (%)	202 (67.1)	211 (70.6)
Weight — kg		
Median	80	81
Interquartile range	73–90	73–90
Height — cm		
Median	172	175
Interquartile range	165–178	168–180
Body-mass index†		
Median	27.5	26.9
Interquartile range	24.7–30.1	24.7–29.4
Cardiovascular risk factors — no./total no. (%)		
Current smoking	96/295 (32.5)	108/299 (36.1)
Hypertension	213/296 (72.0)	199/299 (66.6)
Hypercholesterolemia	122/295 (41.4)	105/299 (35.1)
Diabetes mellitus	105/297 (35.4)	90/299 (30.1)
Prior myocardial infarction — no./total no. (%)	71/300 (23.7)	61/299 (20.4)
Prior stroke — no./total no. (%)	24/300 (8.0)	20/299 (6.7)
Known peripheral arterial disease — no./total no. (%)	40/300 (13.3)	33/299 (11.0)
Prior PCI — no./total no. (%)	63/299 (21.1)	52/299 (17.4)
Prior bypass surgery — no./total no. (%)	20/300 (6.7)	12/299 (4.0)

Table 2. Clinical Course before Randomization.*

Variable	IABP (N=301)	Control (N=299)
Sign of impaired organ perfusion — no./total no. (%)		
Altered mental status	215/300 (71.7)	232/299 (77.6)
Cold, clammy skin and extremities	257/300 (85.7)	245/299 (81.9)
Oliguria	90/300 (30.0)	99/299 (33.1)
Serum lactate >2.0 mmol/liter	226/300 (75.3)	218/298 (73.2)
Serum lactate — mmol/liter		
Median	3.6	4.7
Interquartile range	2.1–7.2	2.3–8.2
Fibrinolysis <24 hr before randomization — no. (%)	28 (9.3)	20 (6.7)
Resuscitation before randomization — no. (%)	127 (42.2)	143 (47.8)
Myocardial infarction — no./total no. (%)		
Non–ST-segment elevation	96/300 (32.0)	81/298 (27.2)
ST-segment elevation	200/300 (66.7)	212/298 (71.1)
Anterior	136/298 (45.6)	116/296 (39.2)
Systolic blood pressure — mm Hg		
Median	89	90
Interquartile range	79–107	80–109
Diastolic blood pressure — mm Hg		
Median	55	55
Interquartile range	46–67	45–65
Mean blood pressure — mm Hg†		
Median	69	68
Interquartile range	59–80	59–80
Use of catecholamines at randomization — no./total no. (%)	270/301 (89.7)	268/298 (89.9)
Heart rate — beats/min		
Median	92	92
Interquartile range	72–110	75–110
Creatinine — mg/dl		
Median	1.30	1.26
Interquartile range	1.04–1.67	1.03–1.64
Creatinine clearance — ml/min‡		
Median	60.7	56.8
Interquartile range	43.4–86.6	39.7–78.1
No. of diseased vessels — no./total no. (%)		
1	61/296 (20.6)	65/293 (22.2)
2	81/296 (27.4)	74/293 (25.3)
3	154/296 (52.0)	154/293 (52.6)
Infarct-related artery — no./total no. (%)		
Left anterior descending	132/293 (45.1)	121/293 (41.3)
Left circumflex	55/293 (18.8)	57/293 (19.5)
Right coronary artery	73/293 (24.9)	79/293 (27.0)
Left main	26/293 (8.9)	28/293 (9.6)
Bypass graft	7/293 (2.4)	8/293 (2.7)
Left ventricular ejection fraction — %		
Median	35	35
Interquartile range	25–45	25–45

* There were no significant differences between the groups with respect to any of the variables listed. To convert the values for creatinine to micromoles per liter, multiply by 88.4.
† The mean blood pressure, an approximation of the time-weighted average of blood pressure values in large arteries during the cardiac cycle, is derived from the area under the curve for invasive blood pressure measurements.
‡ Creatinine clearance was calculated with the use of the Cockcroft–Gault formula.

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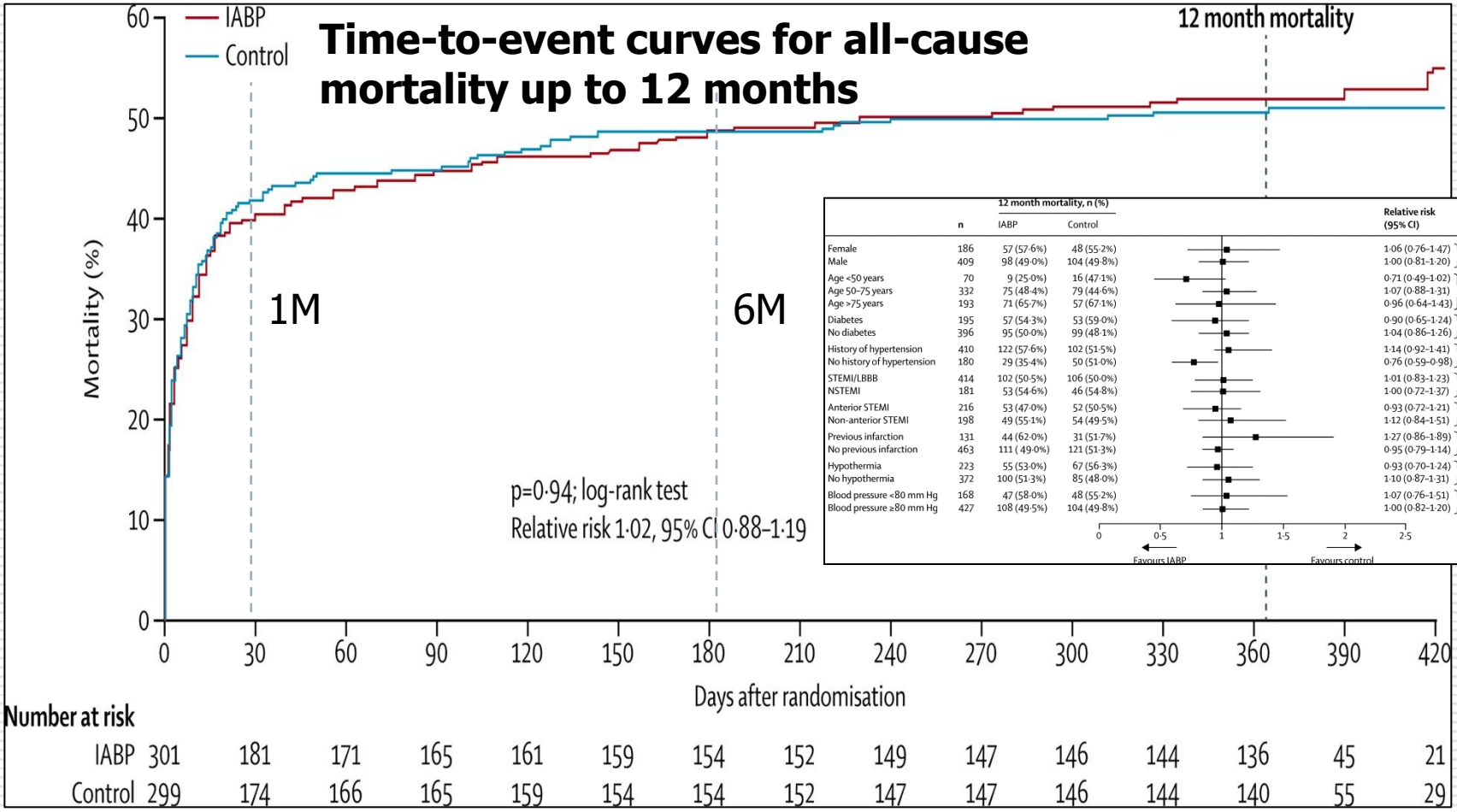
Table 3. Clinical Outcomes.

Outcome	IABP (N=300)	Control (N=298)	P Value	Relative Risk with IABP (95% CI)
	number (percent)			
Primary end point: all-cause mortality at 30 days	119 (39.7)	123 (41.3)	0.69	0.96 (0.79–1.17)
Reinfarction in hospital	9 (3.0)	4 (1.3)	0.16	2.24 (0.70–7.18)
Stent thrombosis in hospital	4 (1.3)	3 (1.0)	0.71	1.32 (0.30–5.87)
Stroke in hospital	2 (0.7)	5 (1.7)	0.28	0.40 (0.08–2.03)
Ischemic	2 (0.7)	4 (1.3)	0.45	0.49 (0.09–2.71)
Hemorrhagic	0	1 (0.3)	0.50	—
Peripheral ischemic complications requiring intervention in hospital	13 (4.3)	10 (3.4)	0.53	1.29 (0.58–2.90)
Bleeding in hospital*				
Life-threatening or severe	10 (3.3)	13 (4.4)	0.51	0.76 (0.34–1.72)
Moderate	52 (17.3)	49 (16.4)	0.77	1.05 (0.74–1.50)
Sepsis in hospital	47 (15.7)	61 (20.5)	0.15	0.77 (0.54–1.08)

* Bleeding during the hospital stay was assessed according to the Global Use of Strategies to Open Occluded Coronary Arteries (GUSTO) criteria.

Thiele H et al. N Engl J Med 2012;367:1287-1296

IABP - SHOCK II



	n	12 month mortality, n (%) IABP	Control	Relative risk (95% CI)	p value for interaction
Female	186	57 (57·6%)	48 (55·2%)	1·06 (0·76–1·47)	0·72
Male	409	98 (49·0%)	104 (49·8%)	1·00 (0·81–1·20)	
Age <50 years	70	9 (25·0%)	16 (47·1%)	0·71 (0·49–1·02)	0·13
Age 50–75 years	332	75 (48·4%)	79 (44·6%)	1·07 (0·88–1·31)	
Age >75 years	193	71 (65·7%)	57 (67·1%)	0·96 (0·64–1·43)	
Diabetes	195	57 (54·3%)	53 (59·0%)	0·90 (0·65–1·24)	0·45
No diabetes	396	95 (50·0%)	99 (48·1%)	1·04 (0·86–1·26)	
History of hypertension	410	122 (57·6%)	102 (51·5%)	1·14 (0·92–1·41)	0·02
No history of hypertension	180	29 (35·4%)	50 (51·0%)	0·76 (0·59–0·98)	
STEMI/LBBB	414	102 (50·5%)	106 (50·0%)	1·01 (0·83–1·23)	0·94
NSTEMI	181	53 (54·6%)	46 (54·8%)	1·00 (0·72–1·37)	
Anterior STEMI	216	53 (47·0%)	52 (50·5%)	0·93 (0·72–1·21)	0·36
Non-anterior STEMI	198	49 (55·1%)	54 (49·5%)	1·12 (0·84–1·51)	
Previous infarction	131	44 (62·0%)	31 (51·7%)	1·27 (0·86–1·89)	0·20
No previous infarction	463	111 (49·0%)	121 (51·3%)	0·95 (0·79–1·14)	
Hypothermia	223	55 (53·0%)	67 (56·3%)	0·93 (0·70–1·24)	0·43
No hypothermia	372	100 (51·3%)	85 (48·0%)	1·10 (0·87–1·31)	
Blood pressure <80 mm Hg	168	47 (58·0%)	48 (55·2%)	1·07 (0·76–1·51)	0·73
Blood pressure ≥80 mm Hg	427	108 (49·5%)	104 (49·8%)	1·00 (0·82–1·20)	

0 0·5 1 1·5 2 2·5
Favours IABP
Favours control

Thiele H et al. N Engl J Med 2012;367:1287-1296
Thiele H et al. Lancet 2013, http://dx.doi.org/10.1016/S0140-6736(13)61783-3

American Heart Association

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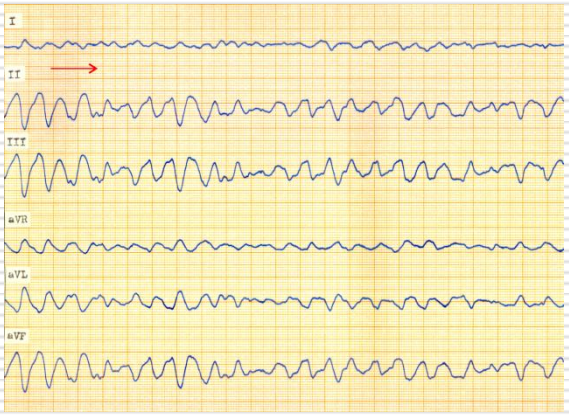
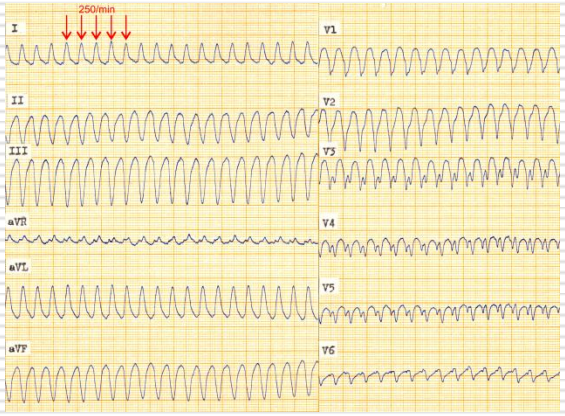




MALIGNÍ ARYTMIE – OHCA

Mimonemocniční oběhová zástava

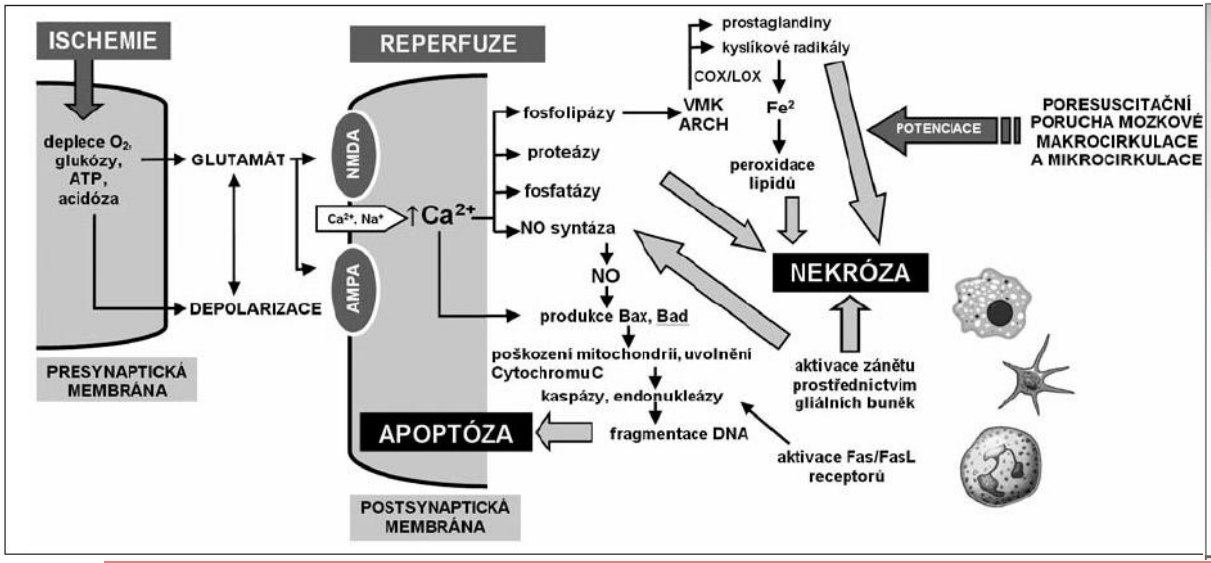
- **Incidence:** 38 případů na 100 000 obyvatel/rok
  - defibrilovatelné rytmy – cca 45 %
    (předpoklad 60-65 % - degenerace v rytmus nedefibrilovatelný)

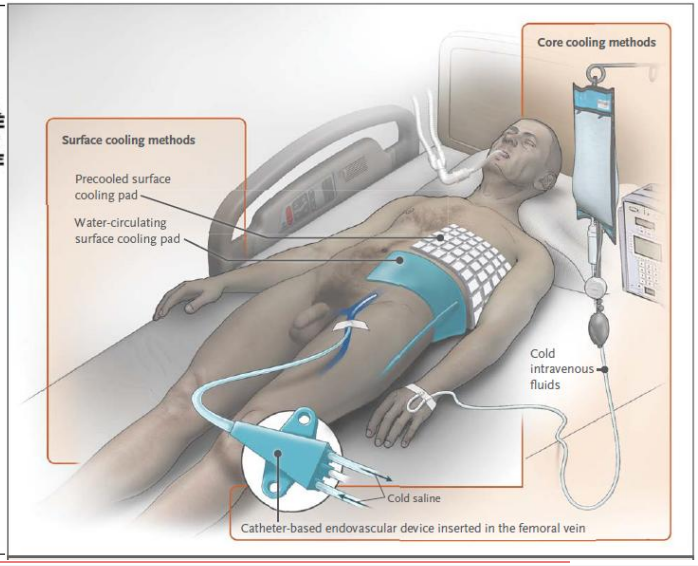
- **Akutní infarkt myokardu**
  - zodpovědný za **40-60 % případů OHCA**
  - fibrilace komor – nejčastěji v prvních hodinách IM

- **Prognóza**
  - ROSC – cca 50 % pacientů
  - propuštění z nemocnice:
    - 2 - 15 % pacientů - celkově
    - 20 % pacientů – defibrilovatelné rytmy

Poresuscitační syndrom

- **Během KPR:** ischemicko-anoxická fáze + hypoxická fáze s hypoperfuzí
- **Po ROSC:** ischemicko-reperfuzní fáze = **poresuscitační syndrom**
  - poškození mozku
  - dysfunkce myokardu
  - syndrom systémové zánětlivé odpovědi
  - trvající příčina zástavy





The Clinical Use of Hypothemia Following Cardiac Arrest *

G. Rainey Williams, Jr., M.D., Frank C. Spencer, M.D.

From the Department of Surgery, The Johns Hopkins University School of Medicine and Hospital, Baltimore, Maryland

As a result of clinical and experimental experience, we have come to consider the following points important. Patients who show evidence of central nervous system damage following cardiac resuscitation should be promptly cooled to 32° to 34° C. and maintained there until there is evidence of return of neurologic function. This has not been longer than three days in our cases.

Annals of Surgery, 1958

Evidence pro MTH

The New England
Journal of Medicine

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VOLUME 346 FEBRUARY 21, 2002 NUMBER 8

MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST

THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

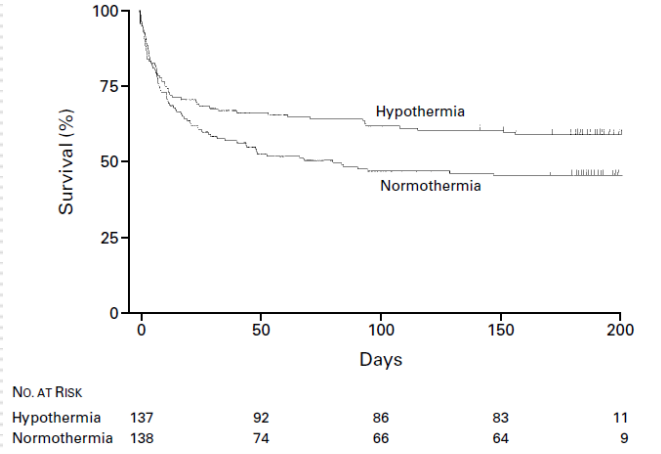
TREATMENT OF COMATOSE SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST WITH INDUCED HYPOTHERMIA

STEPHEN A. BERNARD, M.B., B.S., TIMOTHY W. GRAY, M.B., B.S., MICHAEL D. BUIST, M.B., B.S., BRUCE M. JONES, M.B., B.S., WILLIAM SILVESTER, M.B., B.S., GEOFF GUTTERIDGE, M.B., B.S., AND KAREN SMITH, B.SC.

- **RCT**
- **pacienti po KPR pro FK**
- **cílová TT 32-34°C po dobu 24 hod**

TABLE 2. NEUROLOGIC OUTCOME AND MORTALITY AT SIX MONTHS.

OUTCOME	NORMOTHERMIA	HYPOTHERMIA	RISK RATIO (95% CI)*	P VALUE†
	no./total no. (%)			
Favorable neurologic outcome‡	54/137 (39)	75/136 (55)	1.40 (1.08–1.81)	0.009
Death	76/138 (55)	56/137 (41)	0.74 (0.58–0.95)	0.02



Mild Therapeutic Hypothermia Improves Outcome of Comatose Cardiac Arrest Survivors

(Out of Hospital Witnessed VF Cardiac Arrest)

	Bernard	HACASG
Target Temperature	33°C	32 to 34°C
Time to Target Temperature	2 hours	8 hours
Duration of Cooling	12 hours	24 hours
Good Outcome		
Normothermia	26% (9/34)	39% (54/137)
Hypothermia	49% (21/43)	55% (75/136)
Difference	**23%**	**16%**
Odds Ratio (95% CI)	**5.25 (1.5-18.8)**	**1.4 (1.08-1.81)**

Post-Cardiac Arrest Hypothermia
American Heart Association 2010 Guidelines

- Comatose (ie, lack of meaningful response to verbal commands) adult patients with ROSC after out-of-hospital VF cardiac arrest should be cooled to 32°C to 34°C for 12 to 24 hours (Class I, LOE B)
- Induced hypothermia also may be considered for comatose adult patients with ROSC after in-hospital cardiac arrest of any initial rhythm or after out-of-hospital cardiac arrest with an initial rhythm of pulseless electric activity or asystole (Class IIb, LOE B)

Peberdy, Circulation 2010

What is the optimal target temperature?

Resuscitation Science

Hypothermia in Comatose Survivors From Out-of-Hospital Cardiac Arrest

Pilot Trial Comparing 2 Levels of Target Temperature

Esteban Lopez-de-Sa, MD, FESC; Juan R. Rey, MD; Eduardo Armada, MD; Pablo Salinas, MD; Ana Viana-Tejedor, MD; Sandra Espinosa-Garcia, MD; Mercedes Martinez-Moreno, MD; Ervigio Corral, MD; Jose Lopez-Sendon, MD, PhD, FESC

- Witnessed out-of-hospital cardiac arrest
- Any initial rhythm (VF, PEA, asystole)
- Prospectively randomized to **32 or 34 °C x 24 hours**
- Primary outcome: Survival with good neurologic function (Barthel Index <60)
- 18 patients per group

Lopez-de-Sa, Circulation 2012

Survival with good neurologic function in patients cooled to 32°C vs. 34°C

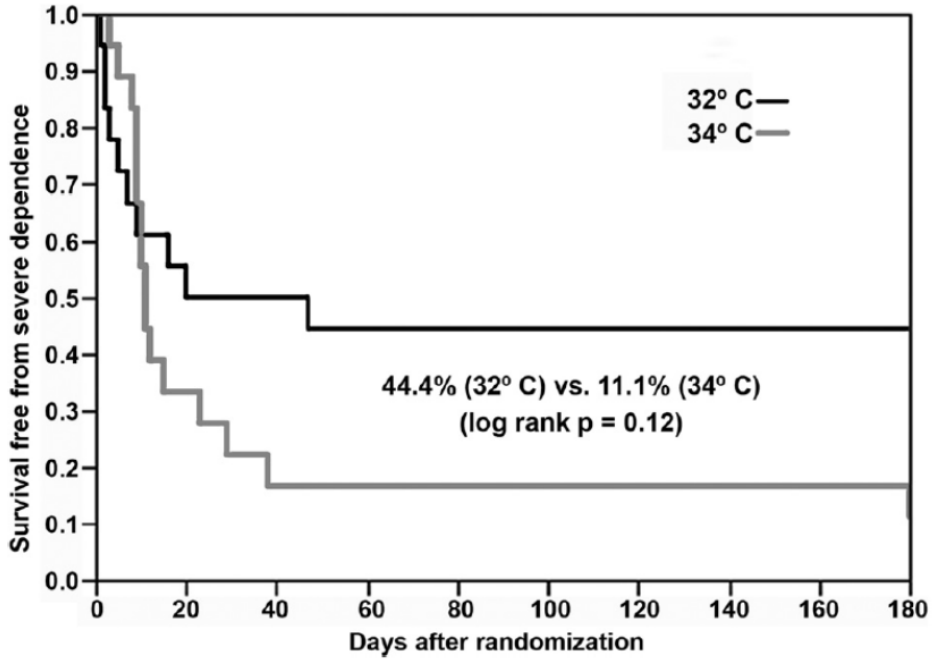
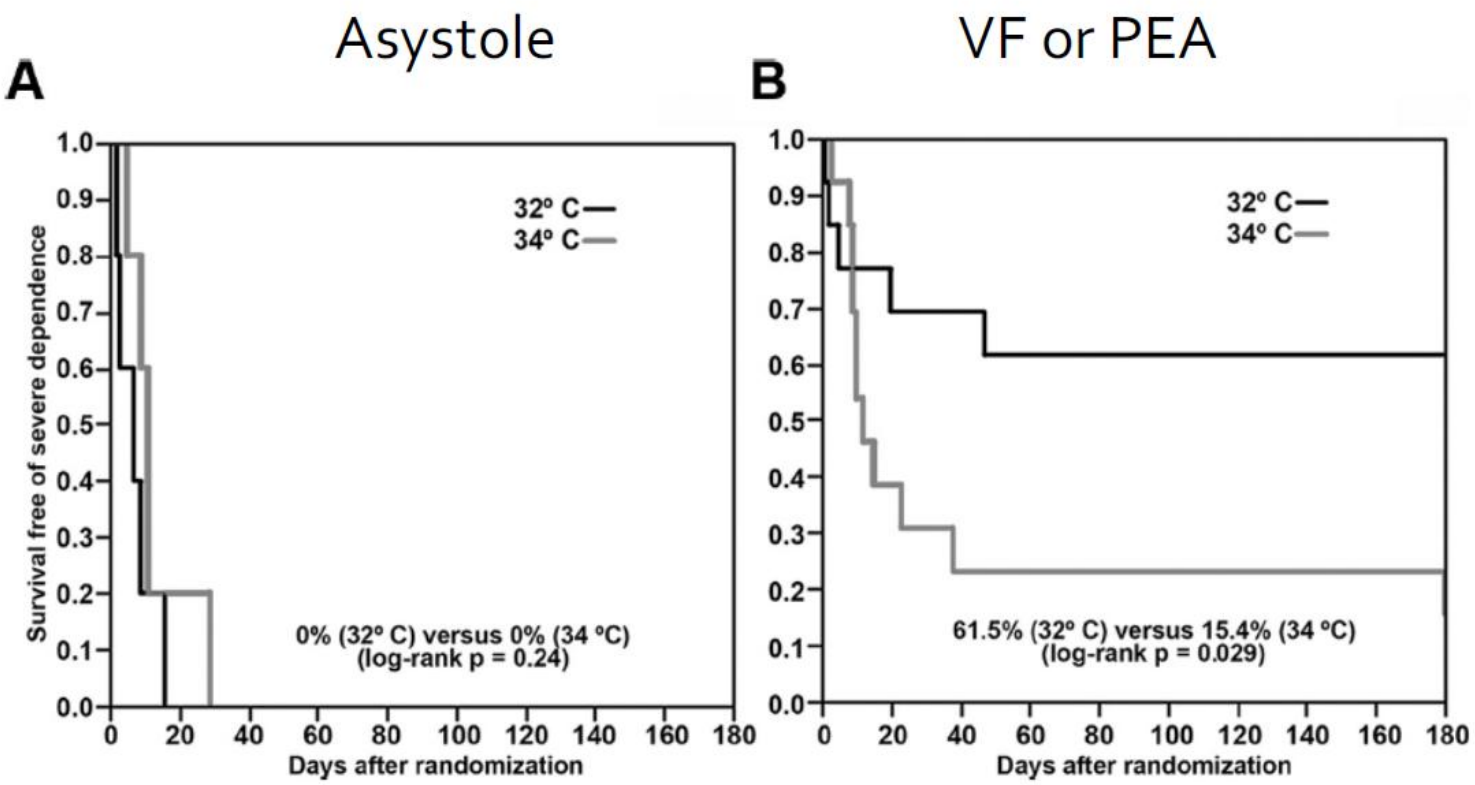


Figure 2. Cumulative survival free of severe dependence at 6 months in the 32°C and 34°C groups.

Lopez-de-Sa, Circulation 2012

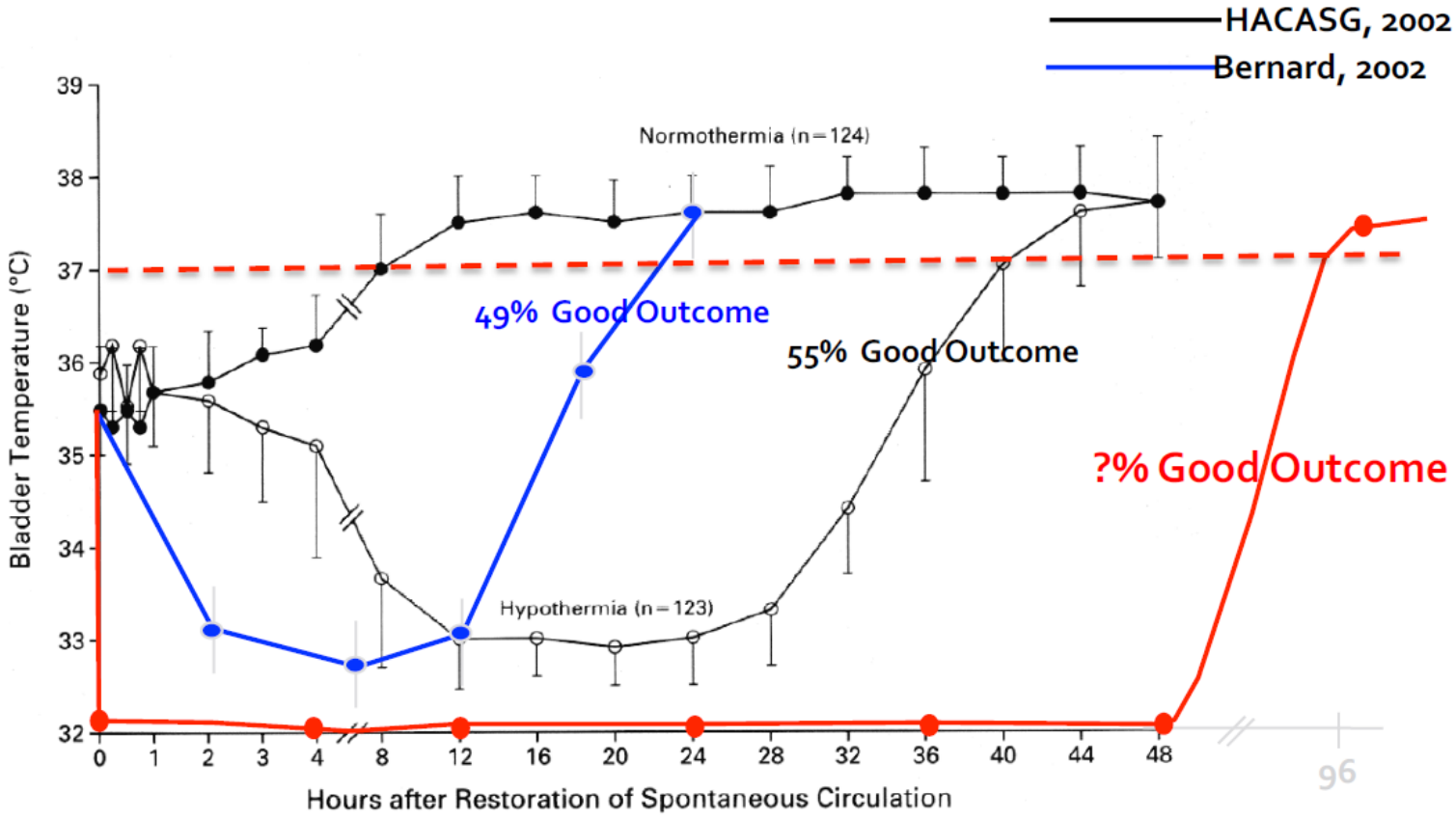
Improved survival with good neurologic function in patients cooled to 32°C vs. 34°C if initial arrest rhythm of VF or PEA



Lopez-de-Sa, Circulation 2012

Optimizing Therapeutic Hypothermia

Comparing temperature curves of two clinical trials



ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

- Out-of-hospital cardiac arrest of presumed cardiac etiology
- All initial rhythms except asystole if unwitnessed
- Comatose with ROSC for at least 20 minutes.
- Prospectively randomized to **32 or 36 °C x 28 hours**
- Primary outcome: All cause mortality at end of trial
- 939 total patients

Nielsen NEJM 2013

Original Article

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

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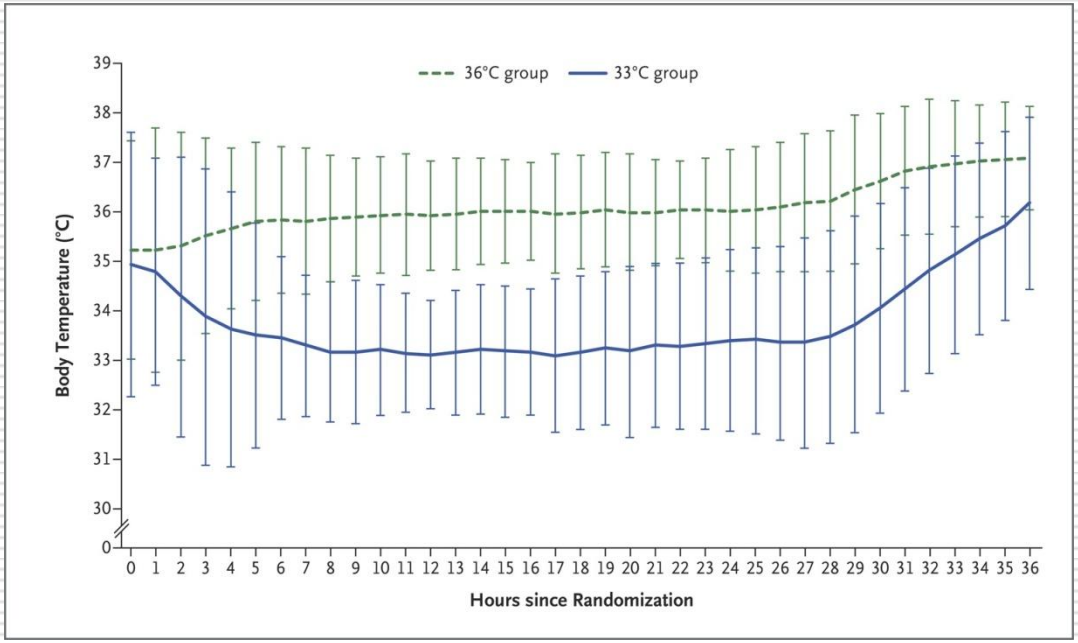
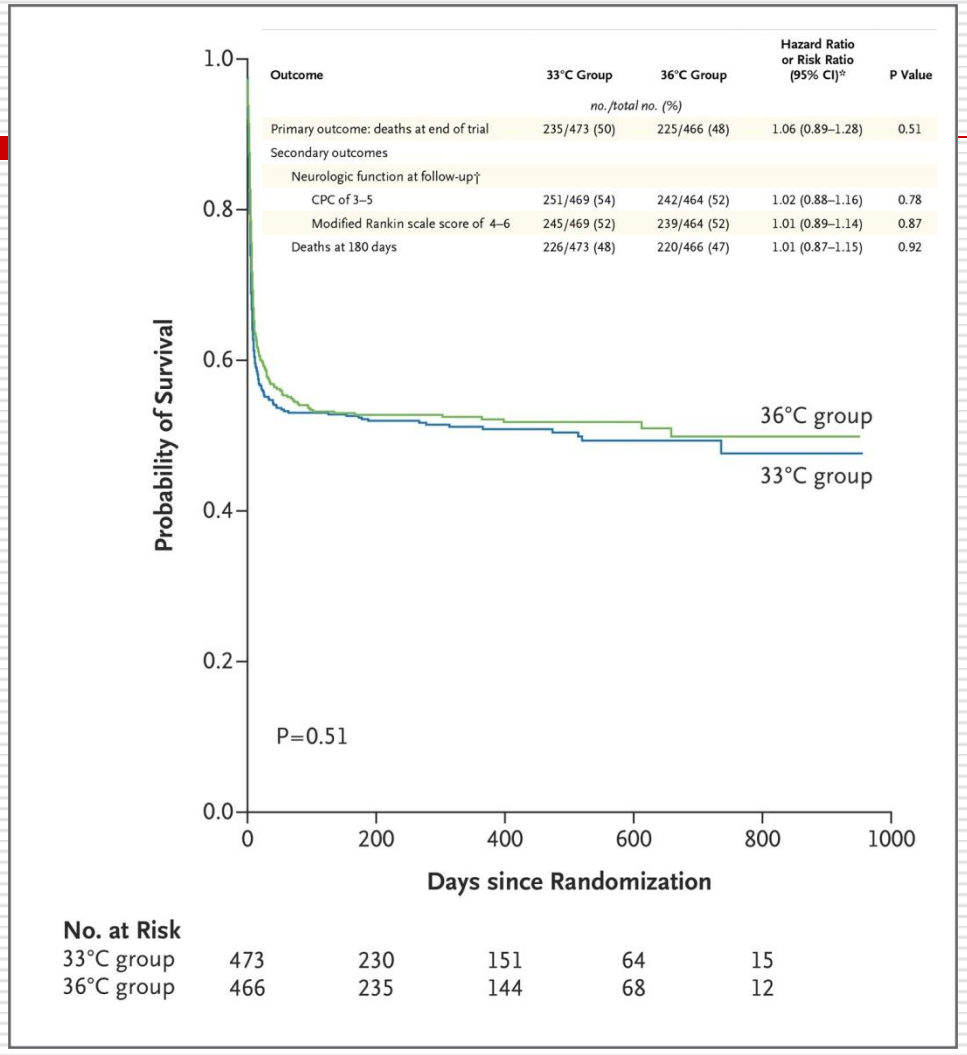


Characteristic	33°C Group (N=473)	36°C Group (N=466)
Demographic characteristics		
Age — yr	64±12	64±13
Male sex — no. (%)	393 (83)	368 (79)
Medical history — no. (%)		
Chronic heart failure	32 (7)	29 (6)
Previous AMI	107 (23)	86 (18)
Ischemic heart disease	145 (31)	115 (25)
Previous cardiac arrhythmia	87 (18)	79 (17)
Arterial hypertension	193 (41)	181 (39)
Previous TIA or stroke	35 (7)	38 (8)
Diabetes mellitus	61 (13)	80 (17)
Asthma or COPD	48 (10)	49 (11)
Previous percutaneous coronary intervention	58 (12)	50 (11)
Previous coronary-artery bypass grafting	47 (10)	42 (9)
Characteristics of the cardiac arrest		
Location of cardiac arrest — no. (%)†		
Place of residence	245 (52)	255 (55)
Public place	197 (42)	188 (40)
Other	31 (7)	22 (5)
Bystander witnessed cardiac arrest — no. (%)	420 (89)	418 (90)
Bystander performed CPR — no. (%)	344 (73)	339 (73)
First monitored rhythm — no. (%)†		
Shockable rhythm	375 (79)	377 (81)
Ventricular fibrillation	349 (74)	356 (77)
Nonperfusing ventricular tachycardia	12 (3)	12 (3)
Unknown rhythm but responsive to shock	5 (1)	5 (1)
Perfusing rhythm after bystander-initiated defibrillation	9 (2)	4 (1)
Asystole	59 (12)	54 (12)
Pulseless electrical activity	37 (8)	28 (6)
Unknown first rhythm, not responsive to shock or not shocked	2 (<0.5)	6 (1)
Time from cardiac arrest to event — min‡		
Start of basic life support		
Median	1	1
Interquartile range	0–2	0–2
Start of advanced life support		
Median	10	9
Interquartile range	6–13	5–13
Return of spontaneous circulation		
Median	25	25
Interquartile range	18–40	16–40
Clinical characteristics on admission		
First measured body temperature — °C	35.2±1.3	35.3±1.1
Glasgow Coma Scale score§		
Median	3	3
Interquartile range	3–4	3–4
Corneal reflex present — no./total no. (%)	264/407 (65)	258/392 (66)
Pupillary reflex present — no./total no. (%)	344/460 (75)	363/458 (79)
Serum pH	7.2±0.2	7.2±0.2
Serum lactate — mmol/liter	6.7±4.5	6.7±4.5
Circulatory shock — no. (%)¶	70 (15)	67 (14)
ST-segment elevation myocardial infarction — no. (%)	190 (40)	194 (42)

Nielsen N et al. N Engl J Med 2013;369:2197-2206

Pravděpodobnost přežití



Outcome	33°C Group	36°C Group	Hazard Ratio or Risk Ratio (95% CI)*	P Value
	no./total no. (%)			
Primary outcome: deaths at end of trial	235/473 (50)	225/466 (48)	1.06 (0.89–1.28)	0.51
Secondary outcomes				
Neurologic function at follow-up†				
CPC of 3–5	251/469 (54)	242/464 (52)	1.02 (0.88–1.16)	0.78
Modified Rankin scale score of 4–6	245/469 (52)	239/464 (52)	1.01 (0.89–1.14)	0.87
Deaths at 180 days	226/473 (48)	220/466 (47)	1.01 (0.87–1.15)	0.92

Neurologický výsledek

Table 3. Neurologic Scores.*

Variable	33°C Group	36°C Group
CPC at follow-up†		
Total no. of patients	469	464
Category — no. (%)		
1	195 (42)	183 (39)
2	23 (5)	39 (8)
3	17 (4)	20 (4)
4	6 (1)	2 (0.5)
5	228 (49)	220 (47)
P value for trend	0.85	
Best, or lowest numerical, CPC during trial		
Total no. of patients	472	466
Category — no. (%)		
1	209 (44)	205 (44)
2	25 (5)	41 (9)
3	37 (8)	37 (8)
4	201 (43)	183 (39)
5	NA	NA
P value for trend	0.89	
Modified Rankin scale score at follow-up†		
Total no. of patients	469	464
Score — no. (%)		
0	88 (19)	89 (19)
1	69 (15)	83 (18)
2	50 (11)	34 (7)
3	17 (4)	19 (4)
4	8 (2)	11 (2)
5	9 (2)	8 (2)
6	228 (49)	220 (47)
P value for trend	0.67	

* P values for trend were calculated with the use of the Cochran–Armitage test. NA denotes not applicable.
† The neurologic follow-up was specified in the protocol to be at 180±14 days, but the time to follow-up was in some cases several weeks longer for logistic reasons.

Nielsen N et al. N Engl J Med 2013;369:2197-2206

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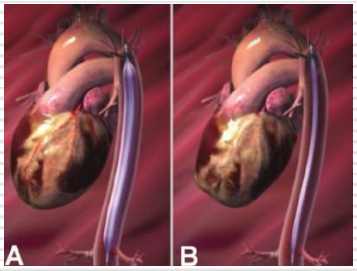
Targeted temperature management following cardiac arrest
An update

December 12th, 2013

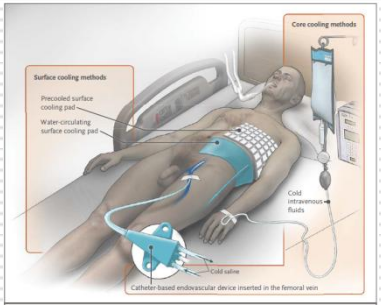
Pending formal Consensus on the optimal temperature, we suggest that clinicians provide postresuscitation care based on the current treatment recommendations. We accept that some clinicians may make a local decision to use a target temperature of 36°C pending this further guidance.

http://www.ilcor.org/news/news-archive/ttm

KARDIOGENNÍ ŠOK…
ECMO VS. IABK?



OBĚHOVÁ ZÁSTAVA…
MTH JAK, JAK DLOUHO A JAK HLUBOKO?



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