Význam echokardiografie a zobrazovacích metod u ischemické choroby srdeční

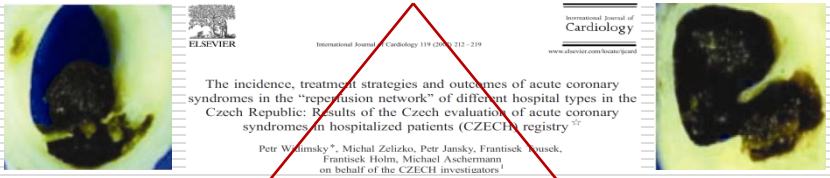
Martin Hutyra

1. interní klinika – kardiologická, Lékařská fakulta Univerzity Palackého a Fakultní nemocnice Olomouc

ICHS – epidemiologie a důsledky

Akutní koronární syndromy

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



ELSEVIER

International Journal of Cardiology

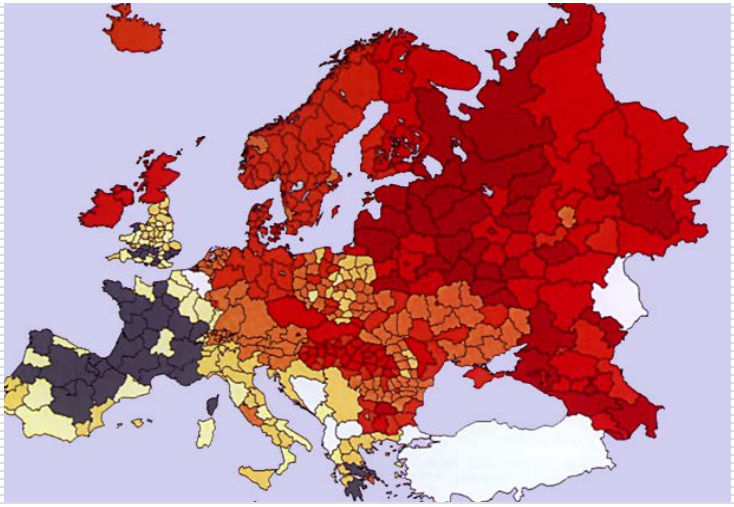
The incidence, treatment strategies and outcomes of acute coronary syndromes in the "reperfusion network" of different hospital types in the Czech Republic: Results of the Czech evaluation of acute coronary syndromes in hospitalized patients (CZECH) registry ☆

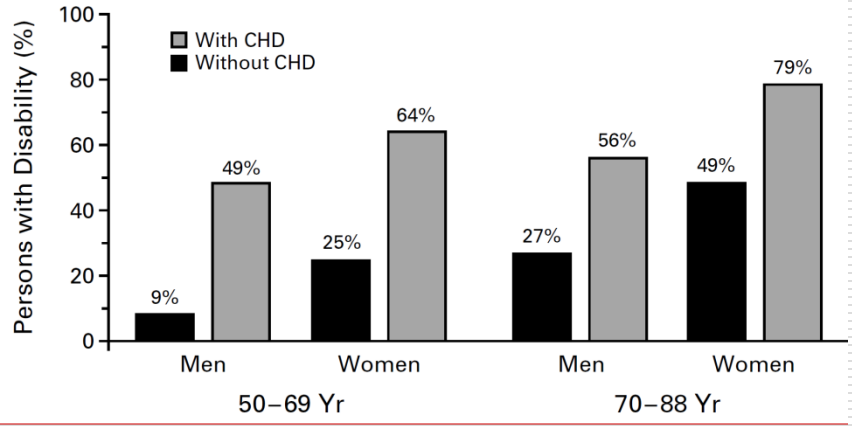
Petr Widimsky*, Michal Zelizko, Petr Jansky, Frantisek Lousek, Frantisek Holm, Michael Aschermann on behalf of the CZECH investigators[1]

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

ICHS - chronické srdeční selhání

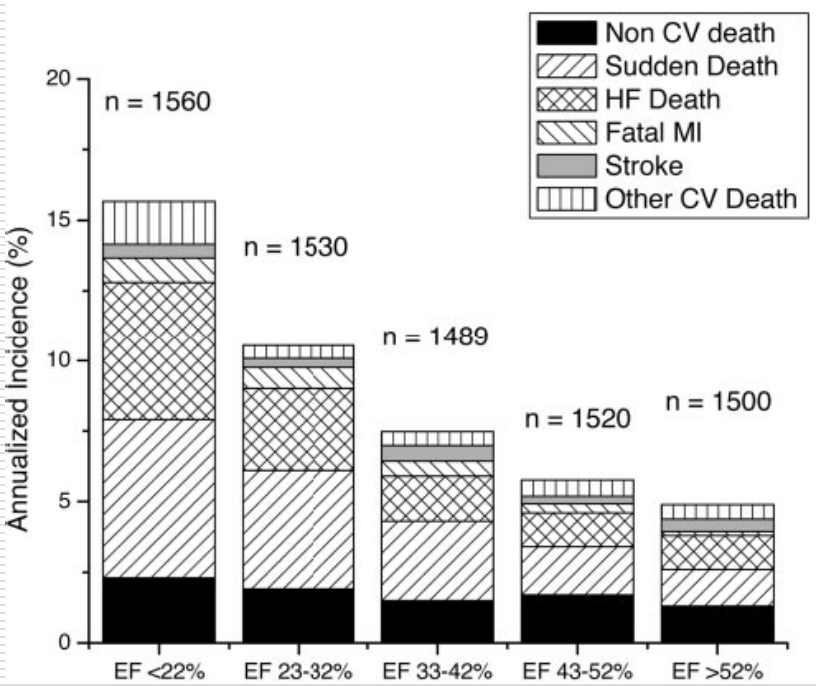
- Metananalýza 24 multicentrických studií léčby CHF
- Publikovaných v *NEJM* (1986-2005)
- Zahrnující > 43 000 pacientů
- Prevalence ICHS u srdečního selhání u 62% pacientů
- CHF prevalence: 0,5-2% (5,5%)

Trial	Year	All Patients	CAD Patients
V-HeFT I	1986	642	282
CONSENSUS	1987	253	146
Milrinone	1989	230	115
PROMISE	1991	1088	590
SOLVD-T	1991	2569	1828
V-HeFT II	1991	804	427
SOLVD-P	1992	4228	3518
RADIANCE	1993	178	107
Vesnarinone	1993	477	249
CHF-STAT	1995	674	481
Carvedilol	1996	1094	521
PRAISE	1996	1153	732
DIG	1997	6800	4793
VEST	1998	3833	2230
RALES	1999	1663	907
DIAMOND	1999	1518	1017
COPERNICUS	2001	2289	1534
BEST	2001	2708	1587
Val-HeFT	2001	5010	2866
MIRACLE	2002	453	244
COMPANION	2004	1520	842
A-HeFT	2004	1050	242
SCD-HeFT	2005	2521	1310
CARE-HF	2005	813	309
Total	19 y	43 568	26 877(62%)

Gheorghiade M. et al. Navigating the Crossroads of Coronary Artery Disease and Heart Failure Circulation. 2006;114:1202-1213
American Heart Association. Heart and Stroke Statistics: 2004 Update. Dallas, Texas: AHA; 2003. http://www.americanheart.org

Prognostický význam ejekční frakce LK

- 7599 pacientů studie CHARM
- Zvýšení RR celkové mortality o 39% s poklesem EF LK o 10% až do hodnoty EF LK 45%
- Od hodnoty EF LK 45% je riziko celkové a KV mortality stabilní



Scott D. Solomon, Nagesh Anavekar, Hicham Skali et al. Influence of Ejection Fraction on Cardiovascular Outcomes in a Broad Spectrum of Heart Failure Patients Circulation 2005; 112; 3738-3744

Mortalita a EF LK (po IM)

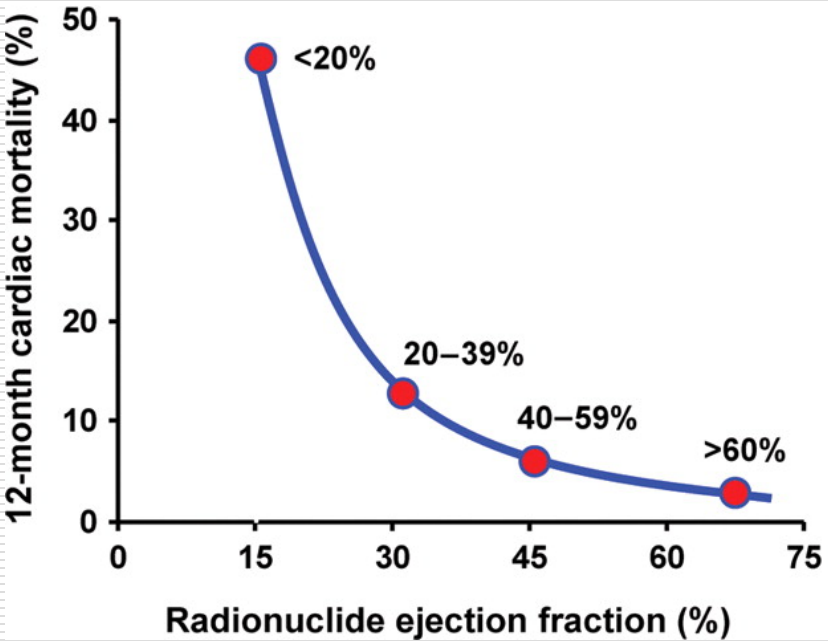
European Journal of Echocardiography
doi:10.1093/ehechocard/jer237

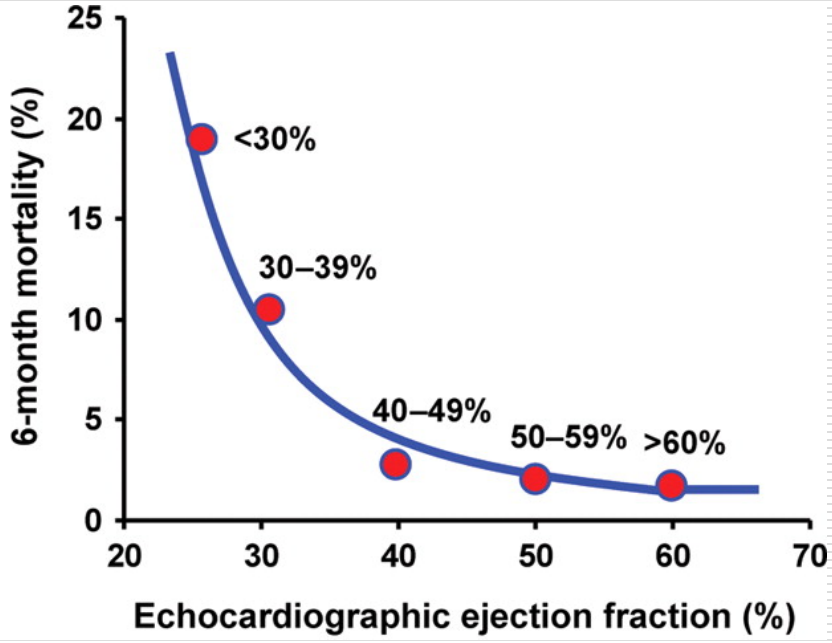
Is viability still viable after the STICH trial?

Lauro Cortigiani[1], Riccardo Bigi[2], and Rosa Sicari[3]*

[1]Cardiovascular Unit, Campo di Marte Hospital, Lucca, Italy; [2]Department of Cardiovascular Sciences, University School of Medicine, Milan, Italy; and [3]Institute of Clinical Physiology, CNR, Via G. Moruzzi 1, 56124 Pisa, Italy

Received 26 August 2011; accepted after revision 17 October 2011





Hyperbolic curves relating mortality and radionuclide and echocardiographic assessed LVEF in patients recovering from an acute myocardial infarction.

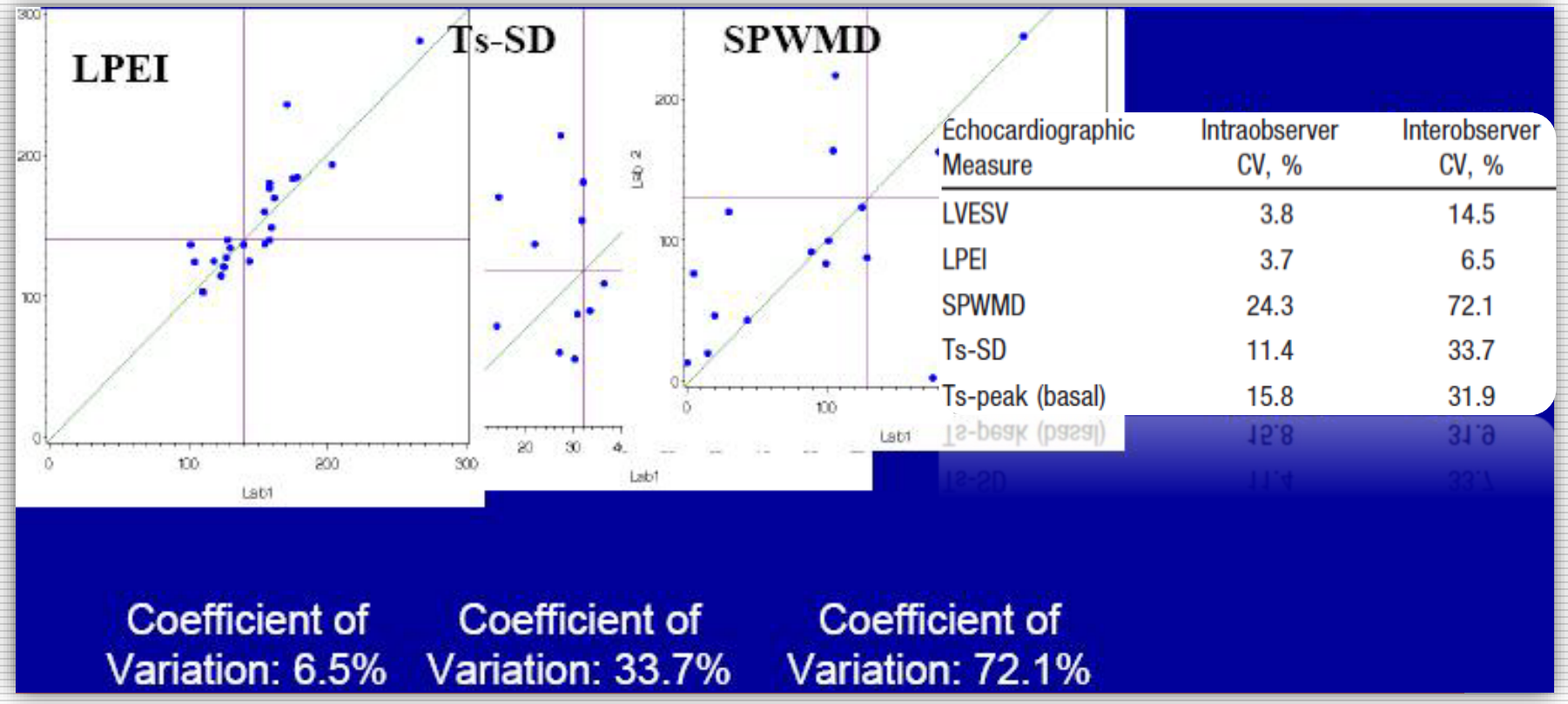
Cortigiani L et al. Eur J Echocardiogr 2011;ejechocard.jer237

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association
Learn and Live

Results of the Predictors of Response to CRT (PROSPECT) Trial
Eugene S. Chung, Angel R. Leon, Luigi Tavazzi, Jing-Ping Sun, Petros Nihoyannopoulos, John Merlino, William T. Abraham, Stefano Ghio, Christophe Leclercq, Jeroen J. Bax, Cheuk-Man Yu, John Gorcsan, III, Martin St John Sutton, Johan De Sutter and Jaime Murillo
Circulation 2008;117:2608-2616; originally published online May 5, 2008;

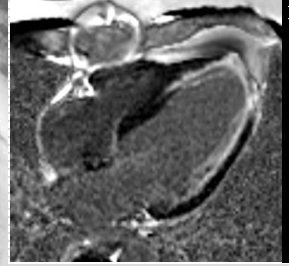
PROSPECT: variabilita

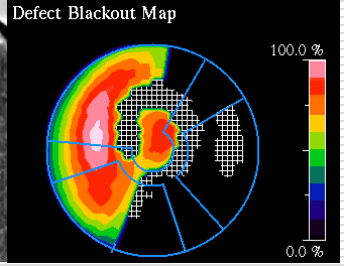
Inter a intraindividuální variabilita měření použitých echokardiografických parametrů znehodnocuje jejich použití v klinické praxi

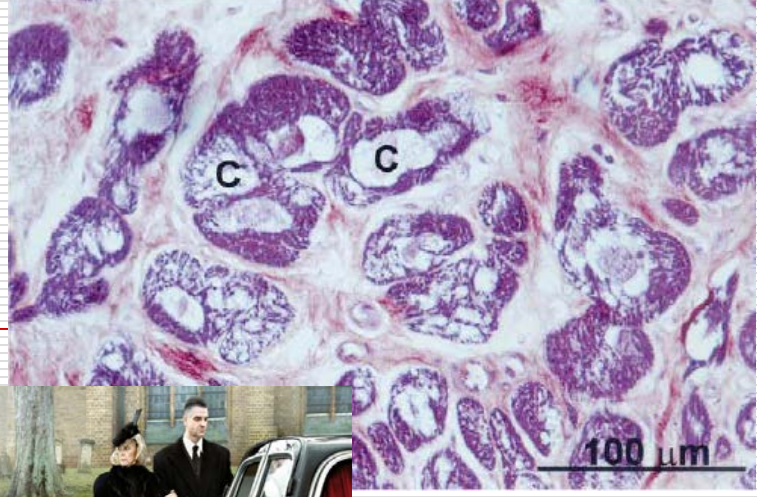


Echocardiographic Measure	Intraobserver CV, %	Interobserver CV, %
LVESV	3.8	14.5
LPEI	3.7	6.5
SPWMD	24.3	72.1
Ts-SD	11.4	33.7
Ts-peak (basal)	15.8	31.9

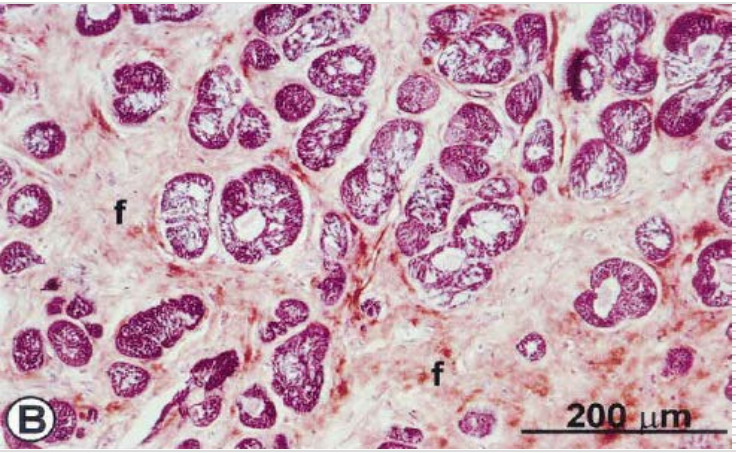
Chung, E. S. et al. Circulation 2008;117:2608-2616







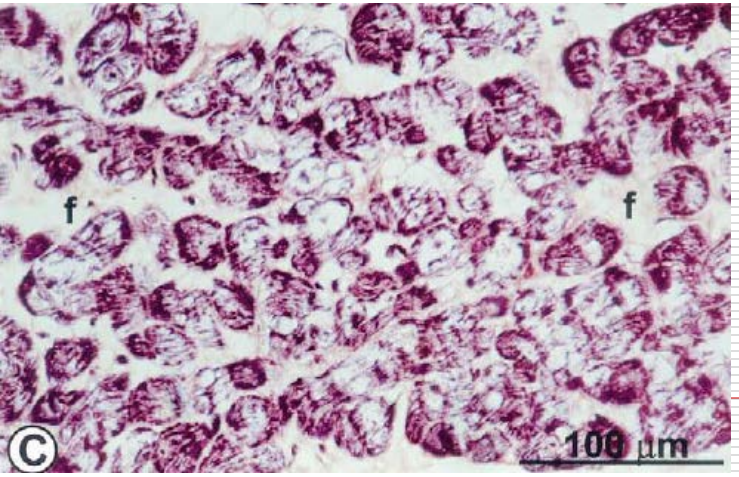
Norma



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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KARDIOLOGIE
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Eur J Echocardiography (2006) 7, 79–108

ELSEVIER

GUIDELINES

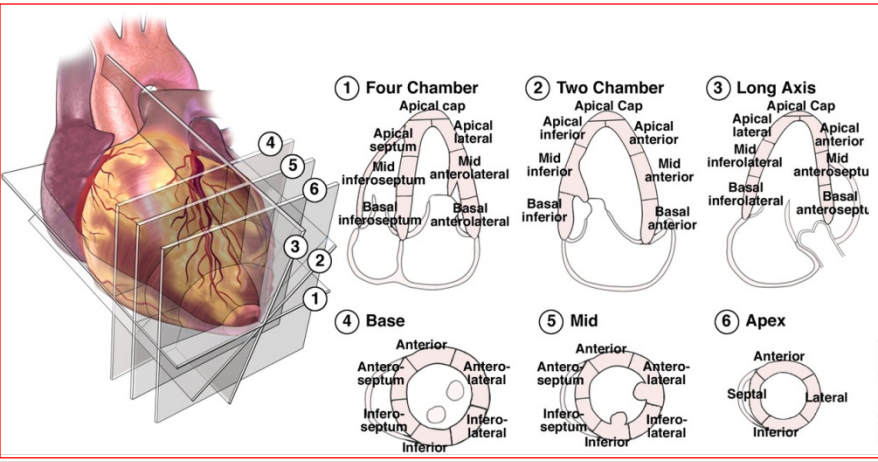
Recommendations for chamber quantification☆

Roberto M. Lang, Michelle Bierig, Richard B. Devereux, Frank A. Flachskampf*, Elyse Foster, Patricia A. Pellikka, Michael H. Picard, Mary J. Roman, James Seward, Jack Shanewise, Scott Solomon, Kirk T. Spencer, Martin St. John Sutton, William Stewart

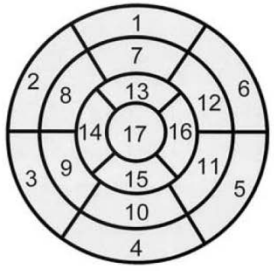
EUROPEAN SOCIETY OF CARDIOLOGY®

Standardized myocardial segmentation and nomenclature for tomographic imaging of the heart: A statement for healthcare professionals from the Cardiac Imaging Committee of the Council on Clinical Cardiology of the American Heart Association

Manuel D. Cerqueira, MD,[b] Neil J. Weissman, MD,[a] Vasken Dilsizian, MD,[b] Alice K. Jacobs, MD,[d] Sanjiv Kaul, MD,[a] Warren K. Laskey, MD,[d] Dudley J. Pennell, MD,[e] John A Rumberger, MD,[c] Thomas Ryan, MD,[a] Mario S. Verani, MDH†,[b] and American Heart Association Writing Group on Myocardial Segmentation and Registration for Cardiac Imaging[a,b,c,d,e]



Left Ventricular Segmentation



1. basal anterior
2. basal anteroseptal
3. basal inferoseptal
4. basal inferior
5. basal inferolateral
6. basal anterolateral
7. mid anterior
8. mid anteroseptal
9. mid inferoseptal
10. mid inferior
11. mid inferolateral
12. mid anterolateral
13. apical anterior
14. apical septal
15. apical inferior
16. apical lateral
17. apex

Coronary Artery Territories

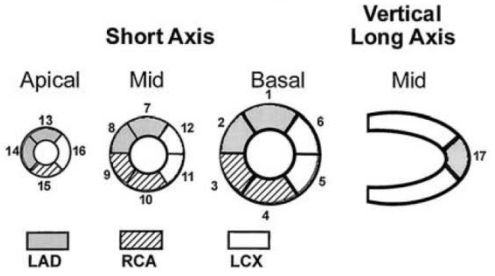
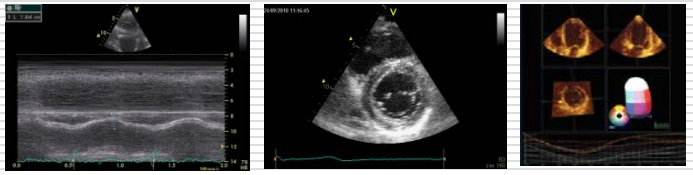


Figure 5. Assignment of the 17 myocardial segments to the territories of the left anterior descending *(LAD)*, right coronary artery *(RCA)*, and the left circumflex coronary artery *(LCX)*. Modified from reference 5.

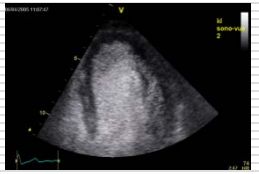
Lang R M et al. Eur J Echocardiogr 2006;7:79-108
Cerqueira MD et al. Standardized myocardial segmentation and nomenclature for tomographic imaging of the heart: A statement for healthcare professionals from the Cardiac Imaging Committee of the Council on Clinical Cardiology of the American Heart Association. Circulation 2002;105:539-42.

Echokardiografie - metody

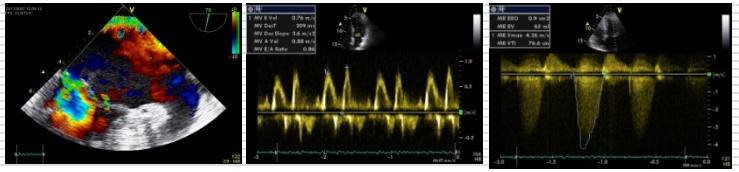
- **MM / 2DE / RT 3DE**



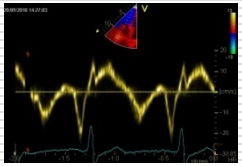
- **CEE**



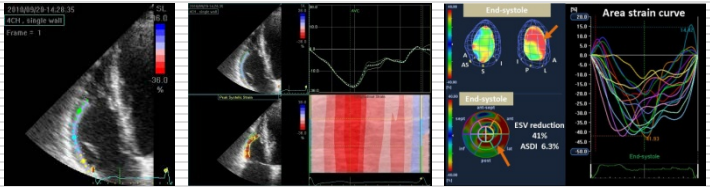
- **Doppler (CFM, PWD, CWD)**



- **Tissue Doppler imaging**

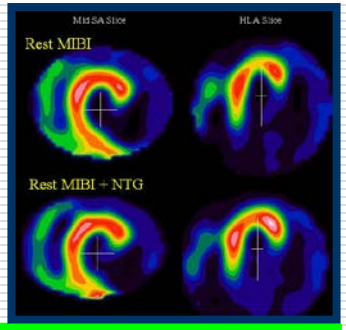


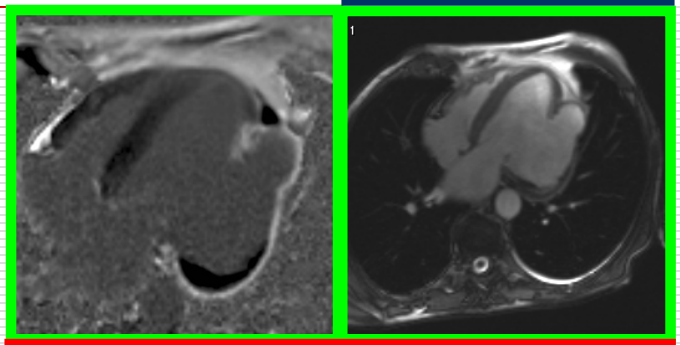
- **2D / 3D strain**

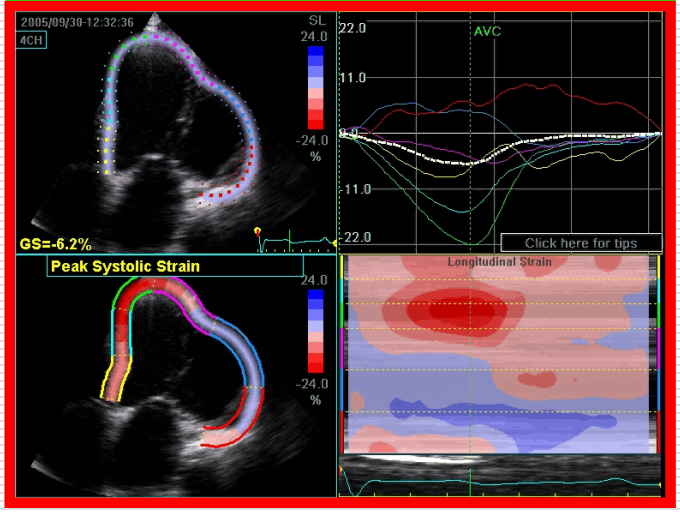


Zobrazovací metody - úvod

- **Dobutaminová echokardiografie**
- **+…. další metody**
- **SPECT/PET**
- **CeCMR** je referenční metodou v zobrazení lokalizace, distribuce a rozsahu jizvy a má vysokou přesnost v predikci (ne)viabilního myokardu. **(1,2)**





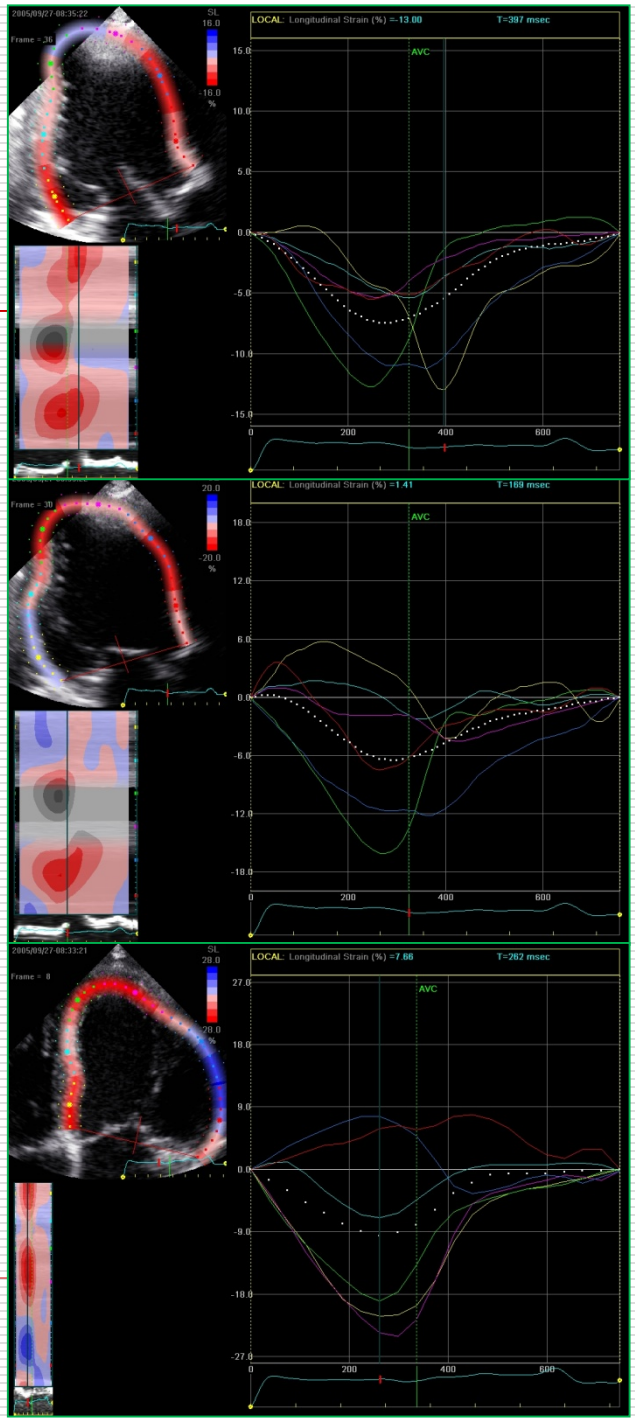


1. Kim RJ, et al. Relationship of MRI delayed contrast enhancement to irreversible injury, infarct age, and contractile function. Circulation 1999;100:1992–2002.
2. Kim RJ, et al. The use of contrast-enhanced magnetic resonance imaging to identify reversible myocardial dysfunction. N Engl J Med 2000;343:1445–53.
3. Becker M, et al. Myocardial Deformation Imaging Based on Ultrasonic Pixel Tracking to Identify Reversible Myocardial Dysfunction. J Am Coll Cardiol 2008;51;1473-1481
4. Becker M. et al. Eur Heart J. 2006 Nov;27(21):2560-6. Epub 2006 Oct 11.

Zobrazovací metody

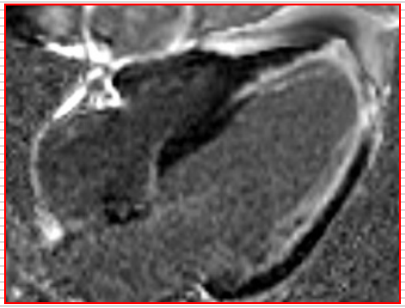
Echokardiografie

- Dobutaminová zátěžová, deformace myokardu LK



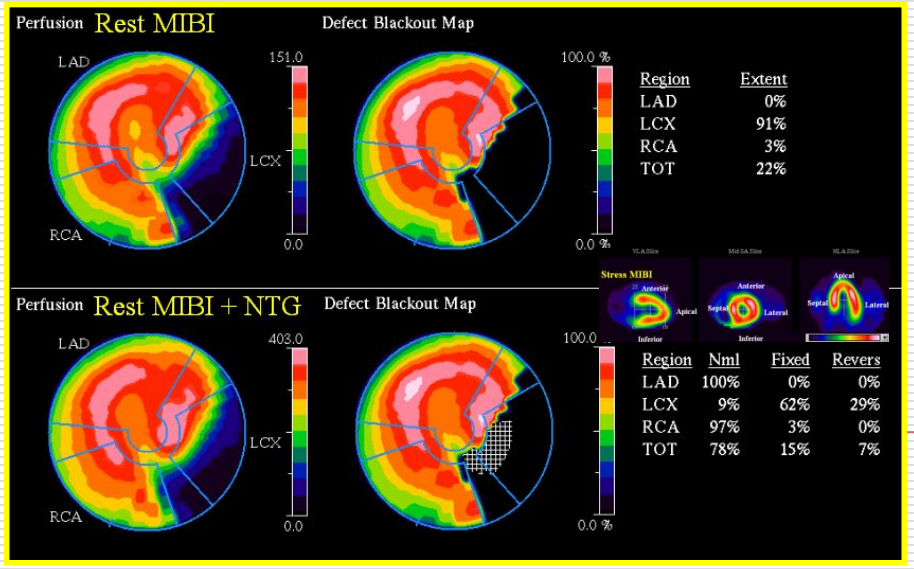
Magnetická rezonance

- LGE

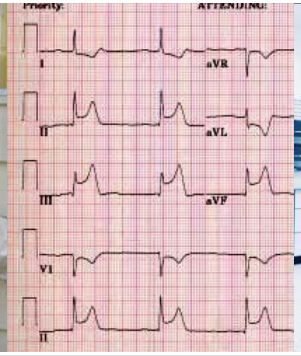


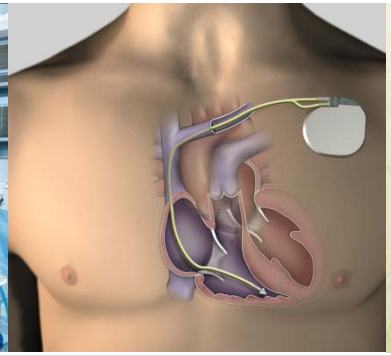
SPECT a PET myokardu

- Perfuzní scintigrafie myokardu
- metabolizmus



Kdy, komu a proč?





Hospitalizace - *přijetí*

- propuštění

	At presentation	Within 48 h	Before or after discharge
Echo at rest	If required for diagnosis	For LV function and presence of thrombus	For LV function, heart failure, shock, or new murmur
Stress ECG			For ischaemia
Stress perfusion SPECT			For viability and ischaemia, infarct size
Stress echo			For viability and ischaemia
PET (rest)			For viability
MRI (rest, stress, contrast-enhanced)			For LV function, infarct size, viability, and ischaemia

40. den od vzniku IM

Chronická ICHS

Van de Werf F. et al. Acute Myocardial Infarction in patients presenting with ST-segment elevation. EHJ 2008;29:2909-2945

Akutní koronární syndromy

Prognostický význam echokardiografie - **MM/2DE/RT 3DE**

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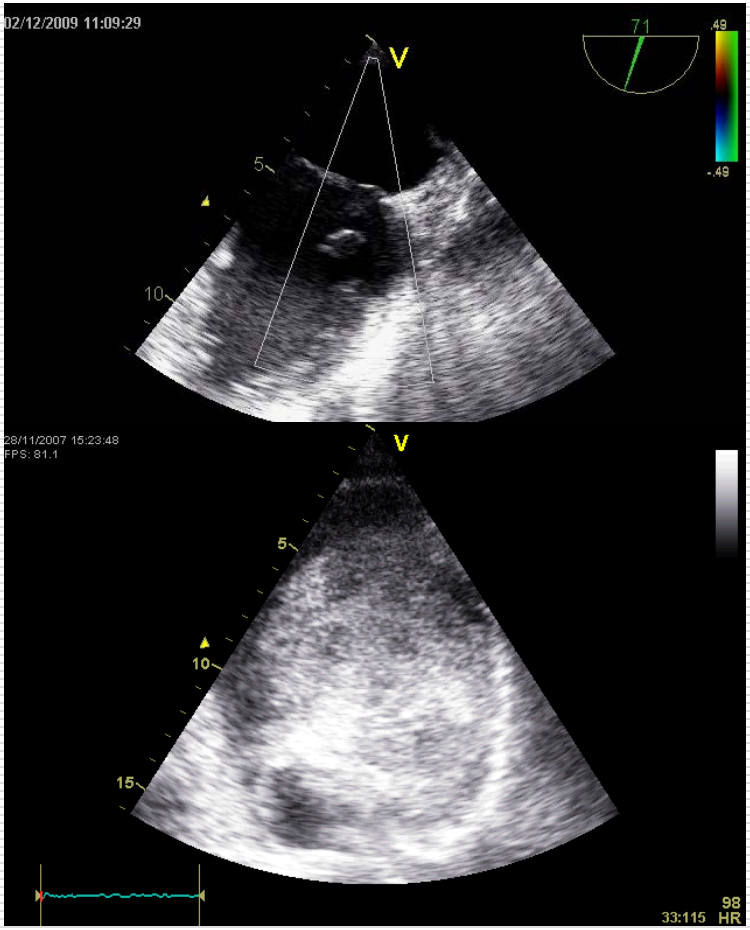
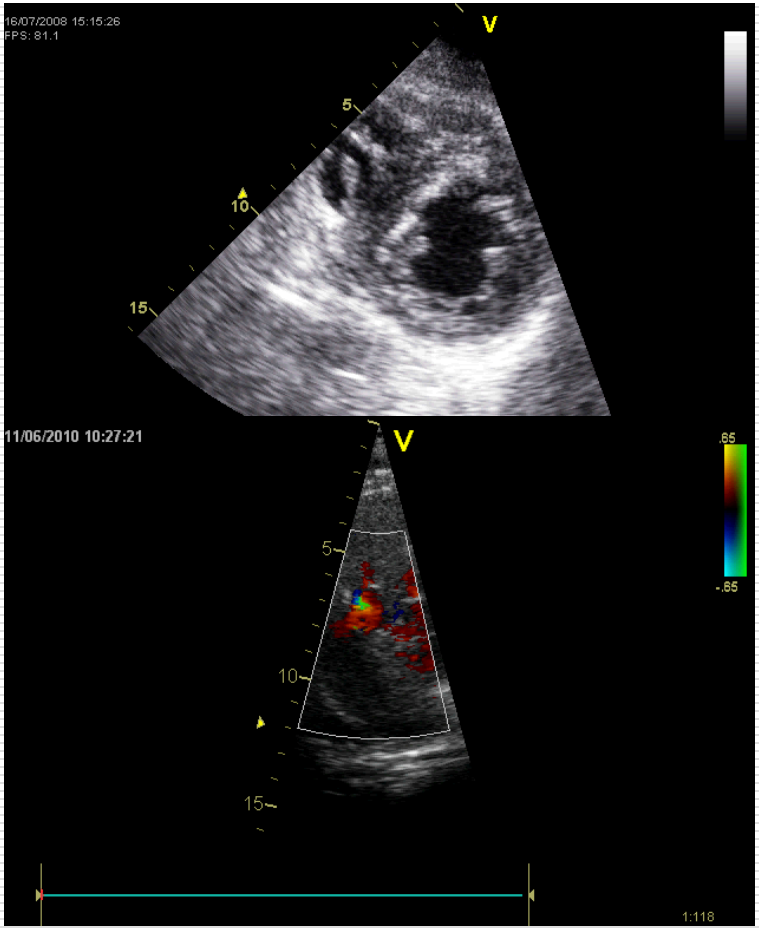
Mechanické komplikace akutního IM

Ruptura papilárního svalu



Ruptura komorového septa



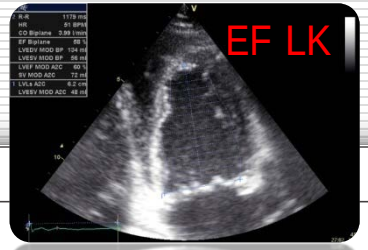
Ruptura volné stěny

Krytá ruptura

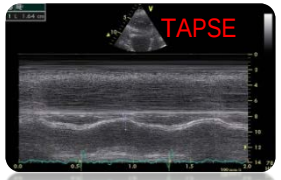
Dg.: STEMI 29%/NSTEMI 49%/NAP 22%
TTE: 1.-12. hod. od přijetí
Parametry: EF LK, TAPSE, ULC
EP: MCE
FU: medián 5 měsíců

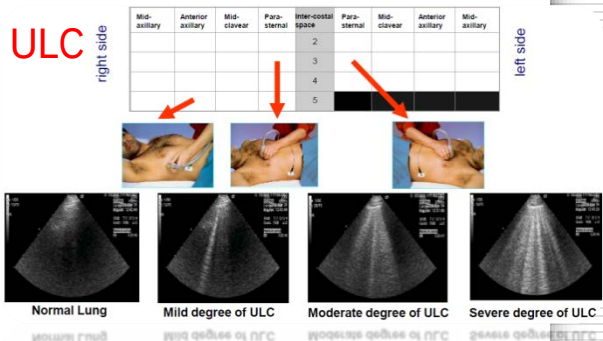
Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome

Gigliola Bedetti, MD[a,*], Luna Gargani, MD[b], Rosa Sicari, MD, PhD[b], Maria Luisa Gianfaldoni, MD[c], Sabrina Molinaro, BSc[b], and Eugenio Picano, MD, PhD[b]



Variable	HR (95% CI)	p Value	HR (95% CI)	p Value
Ejection fraction	1.86 (1.58–2.19)	<0.0001	1.45 (1.02–2.08)	0.040
Wall motion score index	1.75 (1.39–2.20)	<0.0001		
Mitral annular plane systolic excursion	2.09 (1.60–2.73)	<0.0001		
Left ventricular end-diastolic diameter	1.14 (0.88–1.49)	0.312		
Left ventricular end-systolic diameter	1.36 (1.13–1.65)	0.001		
Left ventricular end-diastolic diameter/body surface area	1.26 (1.00–1.58)	0.048		
Left ventricular end-diastolic volume	1.22 (1.02–1.47)	0.033		
Left ventricular end-systolic volume	1.33 (1.15–1.54)	<0.0001		
Left atrium	1.37 (1.14–1.65)	0.001		
Mitral regurgitation	1.96 (1.59–2.41)	<0.0001		
Left ventricular mass index	1.40 (1.19–1.66)	<0.0001		
Diastolic dysfunction	2.03 (1.65–2.50)	<0.0001		
Tricuspid annular plane systolic excursion	2.54 (2.01–3.22)	<0.0001	1.66 (1.13–2.45)	0.010
Right ventricular end-diastolic diameter	1.37 (0.96–1.95)	0.085		
Pulmonary artery systolic pressure	1.60 (1.30–1.96)	<0.0001		
Ultrasound lung comets	1.97 (1.66–2.33)	<0.0001	1.69 (1.25–2.27)	0.001



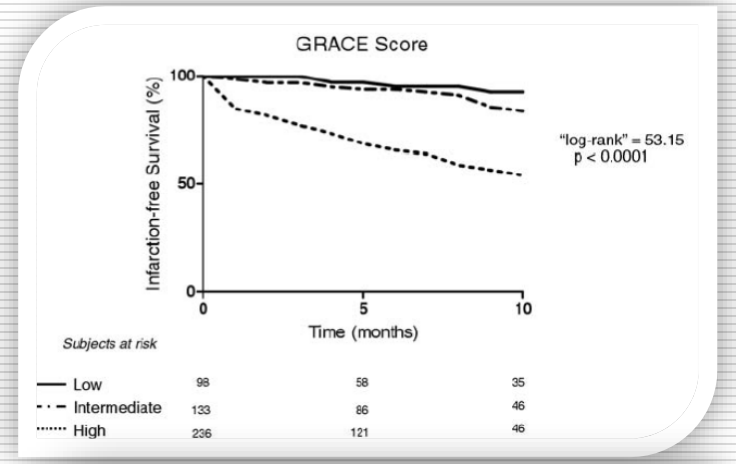


Bedetti G et al. Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome. Am J Cardiol 2010;106:1709 –1716

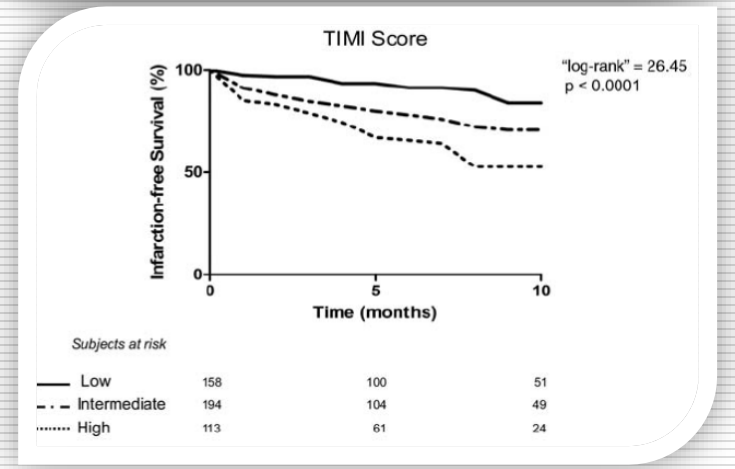
Dg.: STEMI 29%/NSTEMI 49%/NAP 22%
TTE: 1.-12. hod. od přijetí
Parametry: EF LK, TAPSE, ULC
EP: MCE
FU: medián 5 měsíců

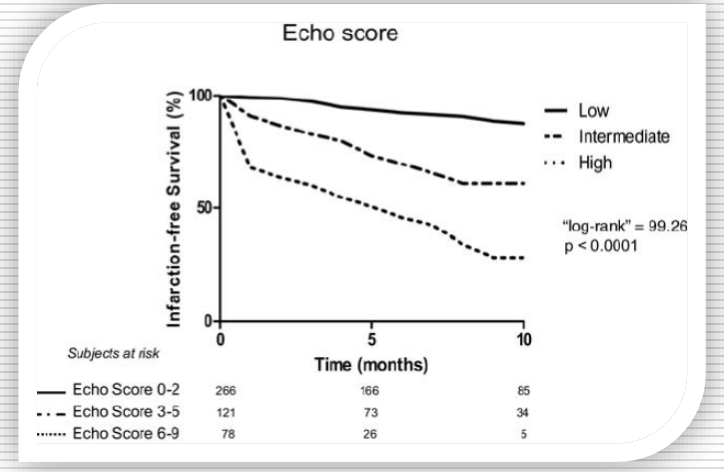
Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome

Gigliola Bedetti, MD[a,*], Luna Gargani, MD[b], Rosa Sicari, MD, PhD[b], Maria Luisa Gianfaldoni, MD[c], Sabrina Molinaro, BSc[b], and Eugenio Picano, MD, PhD[b]



Score	0	1	2	3
EF	≥50%	49-40%	39-30%	<30%
TAPSE	>20 mm	20-15 mm	14-10 mm	<10 mm
ULCs	≤ 5	6-15	16-30	>30





Bedetti G et al. Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome. Am J Cardiol 2010;106:1709 –1716

Dg.: STEMI 29%/NSTEMI 49%/NAP 22%
TTE: 1.-12. hod. od přijetí
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Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome

Gigliola Bedetti, MD[a,*], Luna Gargani, MD[b], Rosa Sicari, MD, PhD[b], Maria Luisa Gianfaldoni, MD[c], Sabrina Molinaro, BSc[b], and Eugenio Picano, MD, PhD[b]

Univariační a multivariační analýza rizikových prediktorů

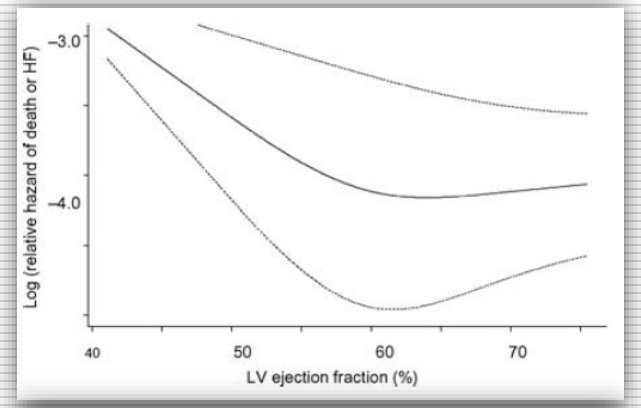
Variable	HR (95% CI)	p Value	HR (95% CI)	p Value
Men*	0.8 (0.5–1.2)	0.214		
New York Heart Association class on admission†	1.7 (1.4–1.9)	<0.0001		
Canadian Cardiovascular Society angina class in previous 6 weeks†	0.964 (0.853–1.1)	0.558		
Previous heart failure*	1.78 (0.9–3.5)	0.099		
Peripheral arterial disease*	1.0 (0.57–1.76)	0.992		
Hemoglobin (g/dl)†	0.8 (0.7–0.8)	<0.0001	0.87 (0.79–0.95)	0.003
Glucose (mg/dl)†	1.0 (1.0–1.0)	<0.0001		
Global Registry in Acute Coronary Events‡	2.84 (1.97–4.09)	<0.0001	1.59 (1.07–2.36)	0.023
Thrombolysis In Myocardial Infarction‡	1.99 (1.54–2.59)	<0.0001		
Echocardiographic score‡	3.15 (2.45–4.04)	<0.0001	2.55 (1.91–3.40)	<0.0001

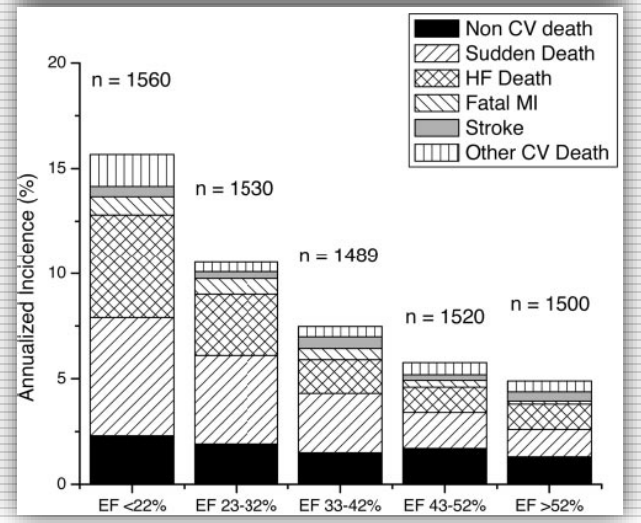
Bedetti G et al. Comparison of Prognostic Value of Echocardiacgraphic Risk Score With the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry In Acute Coronary Events (GRACE) Risk Scores in Acute Coronary Syndrome. Am J Cardiol 2010;106:1709 –1716

2D parametry ?

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association. Learn and Live.

Results of the Predictors of Response to CRT (PROSPECT) Trial
Eugene S. Chung, Angel R. Leon, Luigi Tavazzi, Jing-Ping Sun, Petros Nihoyannopoulos, John Merlino, William T. Abraham, Stefano Ghio, Christophe Leclercq, Jeroen J. Bax, Cheuk-Man Yu, John Gorcsan, III, Martin St John Sutton, Johan De Sutter and Jaime Murillo
Circulation 2008;117:2608-2616; originally published online May 5, 2008;





PROSPECT **závěry:**

1. Interindividuální **variabilita měření ESV** (CV 14.5%) a **EF LK** (průměrná EF LK 23.6±7%, corlab 29.3±10%)
2. 20% zařazených pacientů mělo **EF LK>35%**
3. 1/3 vyšetření neadekvátní **kvalita zobrazení** pro měření ESV
4. Žádná **QC** z centrální laboratoře
5. 3 typy **přístrojů**: 37% GE, 50% Philips, 12% Siemens
6. 40%: staré přístroje

Nicolosi JL. Et al. Effects of perindopril on cardiac remodelling and prognostic value of pre-discharge quantitative echocardiographic parameters in elderly patients after acute myocardial infarction: the PREAMI echo sub-studyEuropean Heart Journal (2009) 30, 1656–1665

Solomon SD et al. Influence of Ejection Fraction on Cardiovascular Outcomes in a Broad Spectrum of Heart Failure Patients Circ 2005; 112; 3738-44

Chung, E. S. et al. Circulation 2008;117:2608-2616

RT-3D EF LK

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Vol. 44, No. 4, 2004
ISSN 0735-1097/04/$30.00
doi:10.1016/j.jacc.2004.05.050

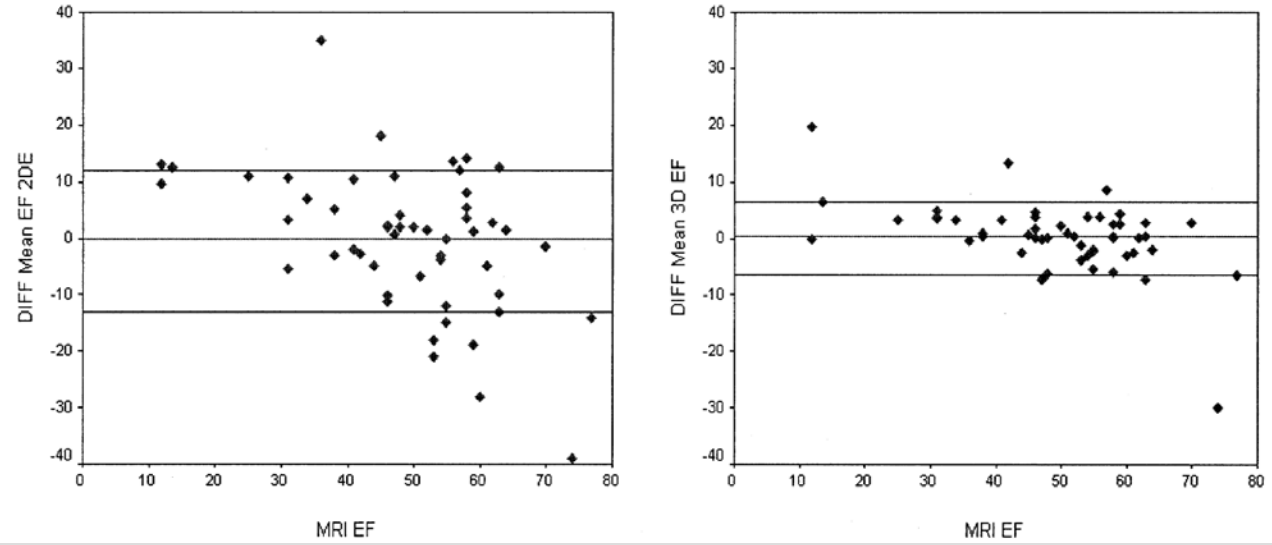
Echocardiography

Reproducibility and Accuracy of Echocardiographic Measurements of Left Ventricular Parameters Using Real-Time Three-Dimensional Echocardiography

Carly Jenkins, BS, Kristen Bricknell, BS, Lizelle Hanekom, MD, Thomas H. Marwick, MD, PhD, FACC

Table 5. Mean Difference Between Echocardiographic and MRI Measurements (n = 50)

	RT-3DE		2DE		Difference in Variance Between MRI and RT-3DE or 2DE	
End-diastolic volume (172 ± 53 ml)	−4 ± 29	p = 0.31	−54 ± 33	p < 0.01	F = 1.31	p = 0.17
End-diastolic volume (91 ± 53 ml)	−3 ± 18	p = 0.23	−28 ± 28	p < 0.01	F = 2.38	p = 0.001
Ejection fraction (50 ± 14%)	0 ± 7	p = 0.74	−1 ± 13	p = 0.76	F = 3.82	p < 0.0001
LV mass (183 ± 50 g)	0 ± 38	p = 0.94	16 ± 57	p = 0.04	F = 2.25	p < 0.003



Jenkins C. et al. Reproducibility and Accuracy of Echocardiographic Measurements of Left Ventricular Parameters Using Real-Time Three-Dimensional Echocardiography. J Am Coll Cardiol 2004;44:878–86

Akutní koronární syndromy

Prognostický význam echokardiografie - **CEE**

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

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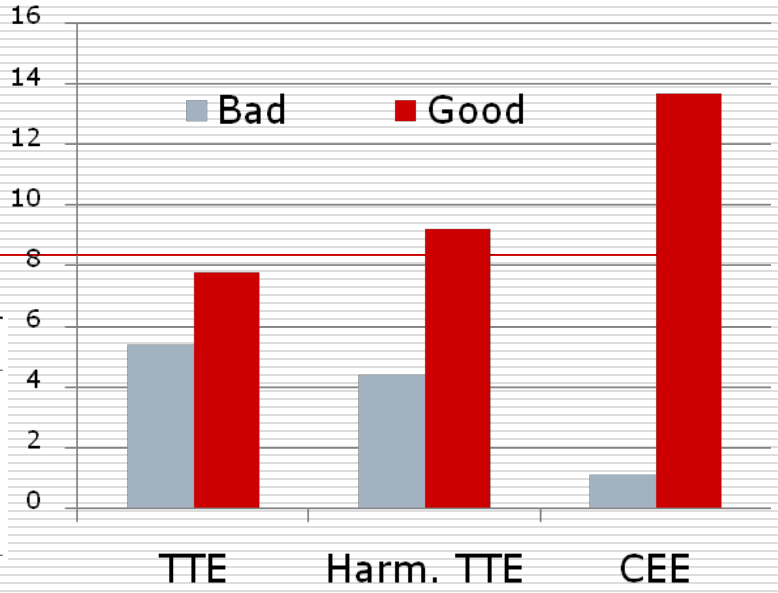
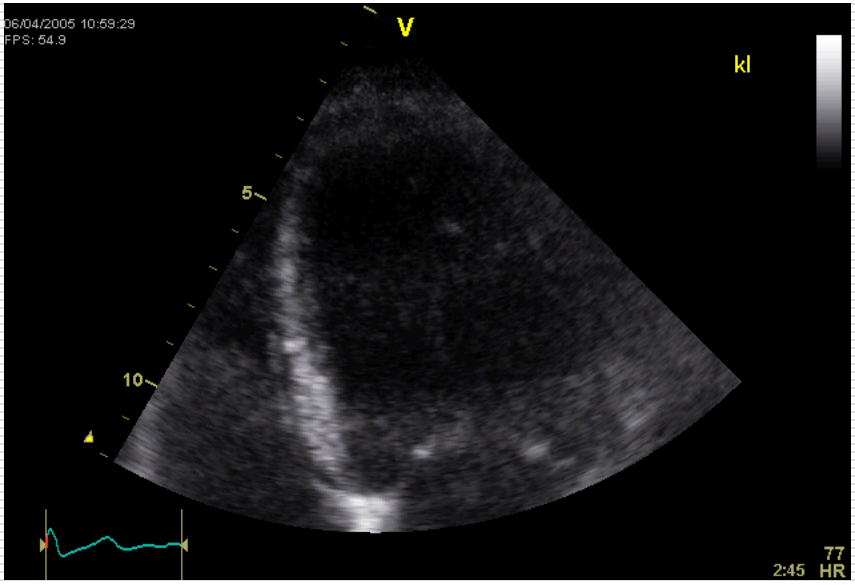
ISSN 0735-1097/00/$20.00
PII S0735-1097(99)00558-6

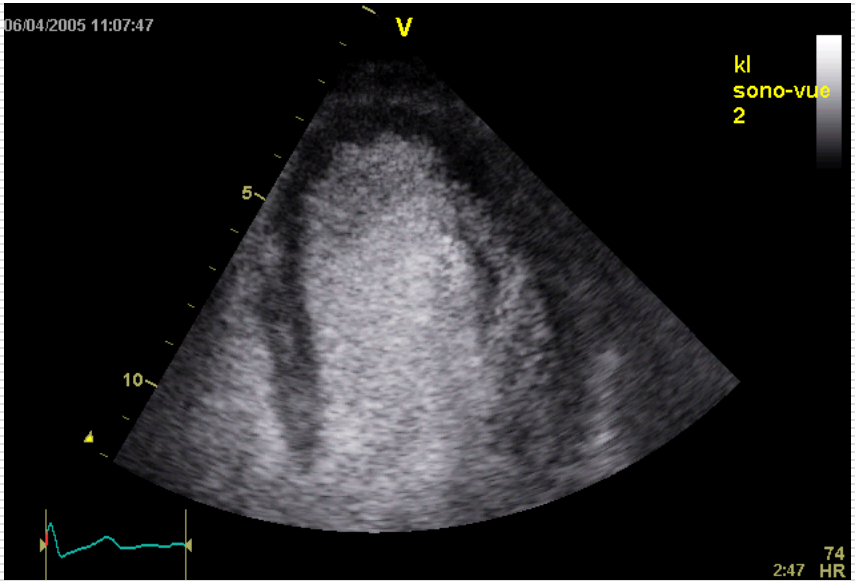
Contrast Echocardiography Clarifies Uninterpretable Wall Motion in Intensive Care Unit Patients

John P. Reilly, MD, Paul A. Tunick, MD, FACC, Robert J. Timmermans, MD, Bruce Stein, MD, Barry P. Rosenzweig, MD, FACC, Itzhak Kronzon, MD, FACC
New York, New York

	Standard	Harmonic	Contrast	Contrast vs. Standard	Contrast vs. Harmonic
Wall Motion: n = 16 segments/patient					
Average no. segments/patient with wall motion Confidence Score A	5.4 (34%)	4.4 (28%)	1.1 (7%)	$p < 0.0001$	$p < 0.0001$
Average no. segments/patient with wall motion Confidence Score C	7.8 (49%)	9.2 (58%)	13.7 (86%)	$p < 0.0001$	$p < 0.0001$
Ejection fraction: n = 70 patients					
No. patients with E.F. Confidence Score A	16 (23%)	9 (13%)	0 (0%)	$p < 0.0001$	$p = 0.002$
No. patients with E.F. Confidence Score C	39 (56%)	42 (62%)	64 (91%)	$p < 0.0001$	$p < 0.0001$







Reilly JP, et al. Contrast echocardiography clarifies uninterpretable wall motion in intensive care unit patients. J Am Coll Cardiol 2000;35:485–90.

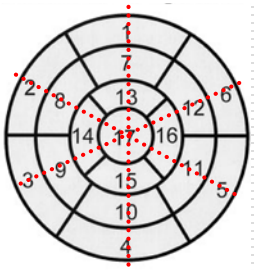
Dg.: STEMI přední
TTE: 5. (±2) den po PCI
Parametry: contrast score index (CSI)
EP: MCE (KV mortalita, reIM, TVR, HF)
FU: 34 měsíců (průměr)

DOI: 10.1111/j.1540-8175.2009.01034.x
Echocardiography

Myocardial Viability Detected by Myocardial Contrast Echocardiography—Prognostic Value in Patients after Myocardial Infarction

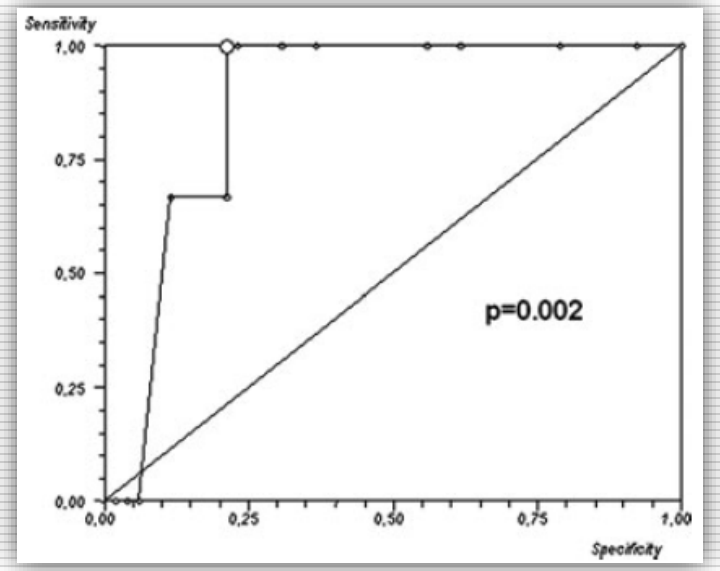
Maria Olszowska, M.D., Ph.D., Magdalena Kostkiewicz, M.D., Ph.D., Piotr Podolec, M.D., Ph.D., Paweł Rubis, M.D., and Wiesława Tracz, M.D., Ph.D.

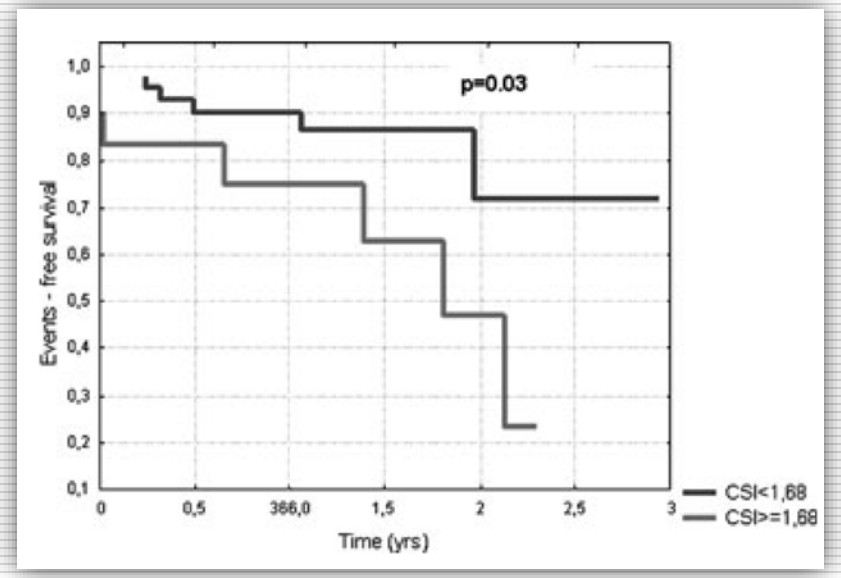
Department of Cardiac and Vascular Disease, Institute of Cardiology, Collegium Medicum of the Jagiellonian University, Krakow, Poland



MCE skóre: (1) normální perfúze, (2) parciální defekt perfúze, (3) absence perfúze
CSI = MCE skóre/počet hodnocených segmentů

Optimální cut-off CSI 1,68
Predikce KV mortality s AUC 0.87, *senzitivita 100%, specificita 79%*
Predikce KV mortality, reIM, TVR, HF s AUC 0.74, *senzitivita 58%, specificita 84%*





CSI ≥ 1.68 = **HR 27.7** mortality, **HR 7.2** KV mortality, reIM, TVR, HF

Olszowska M. et al. Myocardial Viability Detected by Myocardial Contrast Echocardiography - Prognostic Value in Patients after Myocardial Infarction. Echocardiography 2010;27:430-434

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EXPEDITED PUBLICATION **Short Original Research Paper**

Acute Mortality in Hospitalized Patients Undergoing Echocardiography With and Without an Ultrasound Contrast Agent

Results in 18,671 Consecutive Studies

Lisa L. Kusnetzky, BA, Adnan Khalid, MD, Taiyeb M. Khumri, MD, Tabitha G. Moe, MD, Philip G. Jones, MS, Michael L. Main, MD, FACC

Kansas City, Missouri

Objectives We sought to define acute mortality in hospitalized patients undergoing clinically indicated echocardiography with and without use of an ultrasound contrast agent.

Background The U.S. Food and Drug Administration recently issued a boxed warning and new contraindications for the perflutren-containing ultrasound contrast agents following post-marketing reports of 4 patient deaths that were temporally related to Definity (Bristol-Myers Squibb Medical Imaging, Billerica, Massachusetts) administration. To appreciate the incremental risk of any medical procedure, the ambient risk of untoward outcome in the population in question must first be defined. There are no published data on short-term major adverse cardiac events in hospitalized patients undergoing echocardiography, either with or without administration of an ultrasound contrast agent.

Methods A retrospective analysis of hospitalized patients undergoing clinically indicated echocardiography between January 2005 and October 2007, within Saint Luke's Health System, Kansas City, Missouri, was performed. Studies were separated into 2 groups, those performed without contrast enhancement (n = 12,475) and those performed with Definity (n = 6,196). Vital status within 24 h of the echocardiographic study was available for all patients using a combination of the Social Security Death Master File and Saint Luke's Health System medical records. Incidence of death within 24 h was compared by chi-square test between Definity and unenhanced procedures.

Results Of the 18,671 patient events, 72 patients died within 24 h. Of those that underwent unenhanced echocardiography, 46 died within 24 h (0.37%). Of patients receiving Definity during the echocardiogram, 26 died within 24 h (0.42%). There was no statistical difference between these 2 groups (p = 0.60). No patient died within 1 h of the echocardiographic study. In a random sampling from the unenhanced (n = 201) and Definity groups (n = 202), patients who underwent Definity-enhanced echocardiography exhibited higher clinical acuity, and more significant comorbidities.

Conclusions Approximately 0.4% of hospitalized patients die within 24 h of echocardiography. There is no increased mortality risk associated with Definity-enhanced examinations, despite evidence for higher clinical acuity and more comorbid conditions in patients undergoing contrast studies. (J Am Coll Cardiol 2008;51:000–00) © 2008 by the American College of Cardiology Foundation

Akutní koronární syndromy

Prognostický význam echokardiografie - **Doppler**

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

Dg.: 1. NSTE-ACS
TTE: během hospitalizace pro ACS
Parametry: MiR
EP: mortalita
FU: průměr 14±6 m

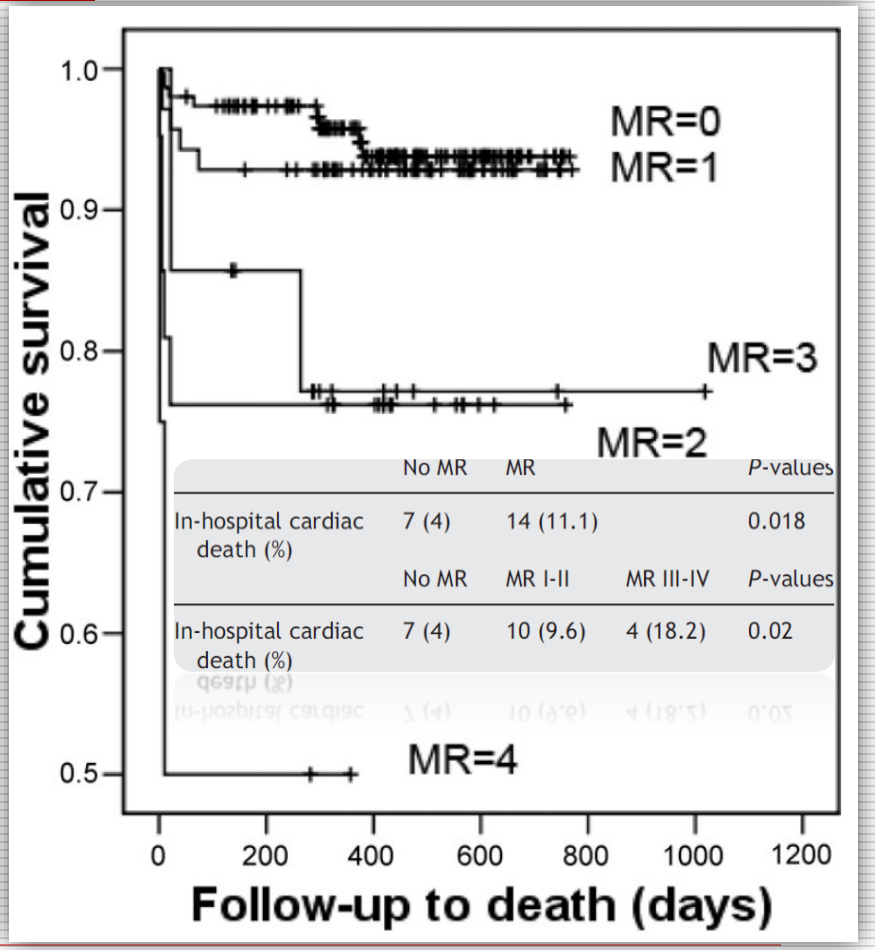
European Heart Journal (2006) 27, 2655–2660
doi:10.1093/eurheartj/ehl287

Clinical research
Coronary heart disease

Prognostic significance of functional mitral regurgitation after a first non-ST-segment elevation acute coronary syndrome

Leopoldo Perez de Isla, Jose Zamorano*, Maribel Quezada, Carlos Almería, José Luis Rodrigo, Viviana Serra, Juan Carlos García Rubira, Antonio Fernandez Ortiz, and Carlos Macaya

	No MR	MR	*P*-values
n(%)	174 (58)	126 (42)	
Mean age (years)	63.9 ± 14	71.3 ± 11	<0.001
Male, *n* (%)	127 (73)	88 (70)	0.6
Hypertension, *n* (%)	107 (61.5)	91 (72.2)	0.06
DM, *n* (%)	42 (24.1)	49 (38.9)	0.006
DM on insulin treatment, *n* (%)	18 (10.3)	17 (13.5)	0.4
Dyslipidaemia, *n* (%)	63 (36.2)	49 (38.9)	0.6
Smoking, *n* (%)	100 (57.5)	61 (48.4)	0.1
AF, *n* (%)	35 (20.1)	29 (23)	0.54
Renal insufficiency, *n* (%)	12 (7)	23 (18.3)	0.002
Previous diagnosis of CAD (%)	22 (12.6)	22 (17.5)	0.2
Previous coronary revascularization (%)	23 (13.2)	26 (20.6)	0.09
Non-permanent ST-segment elevation during acute phase (%)	39 (22.4)	24 (19)	0.5
Q-wave development during or immediately after acute phase (%)	19 (11)	17 (13.5)	0.5
Myocardial markers			
Peak CK	582.2 ± 659	691.4 ± 772	0.24
Peak troponin I	16.2 ± 23	20 ± 24	0.18



	No MR	MR	*P*-values
In-hospital cardiac death (%)	7 (4)	14 (11.1)	0.018

	No MR	MR I-II	MR III-IV	*P*-values
In-hospital cardiac death (%)	7 (4)	10 (9.6)	4 (18.2)	0.02

De Isla LP et al. Prognostic significance of functional mitral regurgitation after a first non-ST-segment elevation acute coronary syndrome. European Heart Journal (2006) 27, 2655–2660

Dg.: 1. NSTE-ACS
TTE: během hospitalizace pro ACS
Parametry: MiR
EP: mortalita
FU: průměr 14±6 m

European Heart Journal (2006) 27, 2655–2660
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Clinical research
Coronary heart disease

Prognostic significance of functional mitral regurgitation after a first non-ST-segment elevation acute coronary syndrome

Leopoldo Perez de Isla, Jose Zamorano*, Maribel Quezada, Carlos Almería, José Luis Rodrigo, Viviana Serra, Juan Carlos García Rubira, Antonio Fernandez Ortiz, and Carlos Macaya

Prediktory hospitalizační mortality

	OR	95% CI	*P*-values
Univariable			
Age	1.06	1.02–1.11	0.008
Gender	0.9	0.4–2.6	0.9
Hypertension	1.03	0.4–2.6	0.9
DM	1.8	0.7–4.4	0.2
Renal insufficiency	2.6	0.88–7.6	0.082
LVEF	0.9	0.9–1.02	0.7
WM abnormalities	0.8	0.3–1.9	0.6
Left-atrium diameter	2.6	0.88–7.6	0.082
PASP	1.1	1.004–1.2	0.042
Peak CK	1.0	0.9–1.001	0.9
Mean number of vessels	1.7	0.5–5.8	0.4
Previous diagnosis of CAD	0.6	0.1–2.6	0.5
Q EKG	2.5	0.86–7.3	0.12
MR	1.81	1.25–2.62	0.002
Multivariable			
Age	1.1	0.8–1.6	0.4
Renal insufficiency	2.7	0.002–40.1	0.6
Left-atrium diameter	0.6	0.3–1.2	0.2
PASP	1.4	0.9–1.9	0.09
MR	0.001	0.4–33.3	0.6

Prediktory dlouhodobé mortality

	HR	95% CI	*P*-values
Univariable			
Age	1.06	1.02–1.1	0.005
Gender	1.2	0.5–2.9	0.8
Hypertension	1.2	0.5–2.9	0.7
DM	1.0	0.8–4.1	0.2
Renal insufficiency	3.2	1.03–1.13	0.009
LVEF	0.9	0.9–1.01	2.5
WM abnormalities	0.9	0.4–2.1	0.9
Left-atrium diameter	1.08	1.03–1.13	0.001
PASP	1.09	1.02–1.15	0.008
Peak CK	1.0	0.9–1.01	0.8
Mean number of vessels	1.8	0.8–4.4	0.2
Previous diagnosis of CAD	0.8	0.2–2.6	0.7
Q EKG	2.1	0.8–5.5	0.2
MR	1.92	1.39–2.64	<0.001
Multivariable			
Age	1.07	0.8–1.3	0.6
Renal insufficiency	0.3	0.012–5.2	0.4
Left-atrium diameter	0.8	0.6–1.03	0.08
PSAP	1.1	1.01–1.2	0.55
MR	5.02	1.03–24.4	0.045

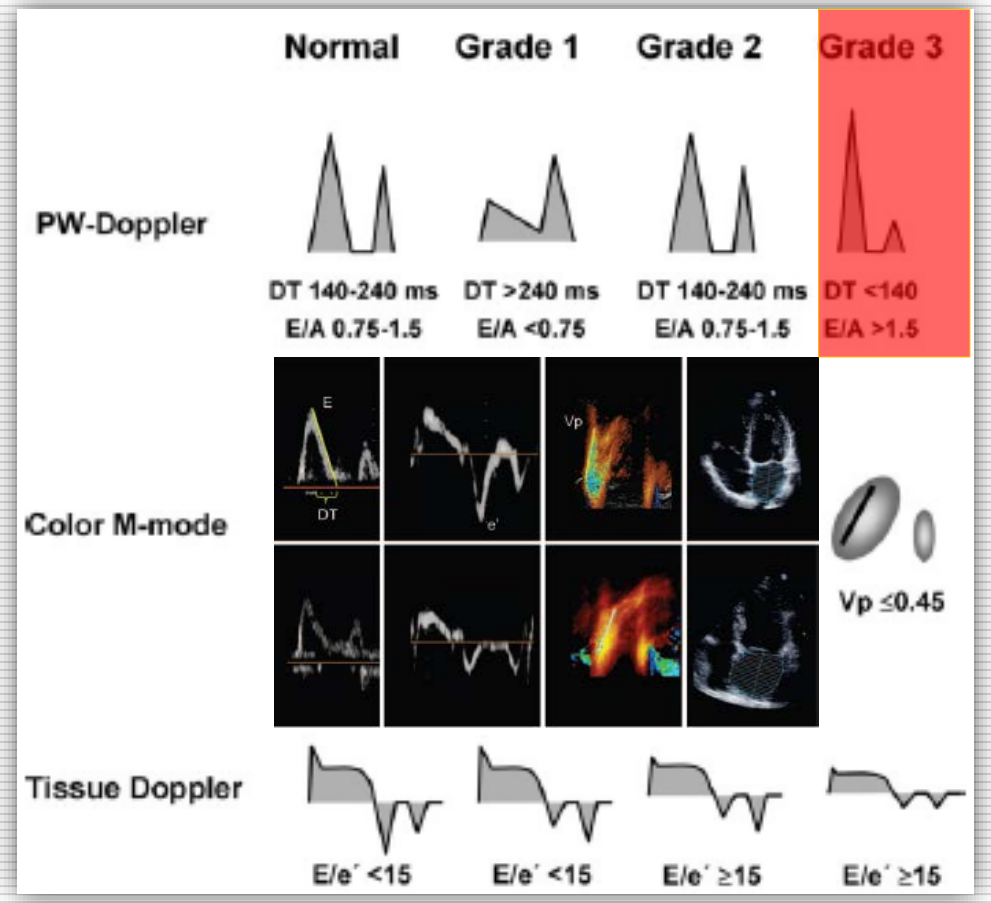
De Isla LP et al. Prognostic significance of functional mitral regurgitation after a first non-ST-segment elevation acute coronary syndrome. European Heart Journal (2006) 27, 2655–2660

Dg.: AIM bez AF
TTE: hospitalizace
Parametry: restriktivní plnění LK
EP: mortalita
FU: ?

Independent Prognostic Importance of a Restrictive Left Ventricular Filling Pattern After Myocardial Infarction

An Individual Patient Meta-Analysis: Meta-Analysis Research Group in Echocardiography Acute Myocardial Infarction

Meta-Analysis Research Group in Echocardiography (MeRGE) AMI Collaborators*



Characteristic	Nonrestrictive (n=2726)	Restrictive (n=670)	*P*
Age, y	64.2 (12.0)	63.2 (13.3)	0.09
Risk factors, n (%)			
Male gender	2010 (74)	502 (75)	0.51
Current smoker (n=1574)	609 (47)	134 (50)	0.26
Hypertension (n=2177)	610 (34)	147 (36)	0.43
Diabetes (n=1946)	265 (17)	84 (24)	0.002
Prior AMI (n=2384)	313 (16)	84 (20)	0.06
Hyperlipidemia (n=1299)	179 (17)	50 (22)	0.04
Anterior AMI (n=2442)	938 (47)	275 (62)	<0.0001
Killip class (n=1746), %			
I	984 (70)	133 (39)	
II	326 (23)	124 (37)	<0.0001
III/IV	99 (7)	80 (24)	
LV ejection fraction, %	47 (10)	40 (11)	<0.0001
LV ESVi (n=1575), mL/m^2	35 (15)	46 (19)	<0.0001
LV end-diastolic volume index (n=1575), mL/m^2	66 (21)	76 (24)	<0.0001
E deceleration time, ms	203 (52)	120 (16)	<0.0001
E/A ratio (n=3311)	1.03 (0.44)	1.71 (0.95)	<0.0001
Length of follow-up, median, d	1060	1072	...
Deaths, n (%)	307 (11.3)	192 (28.7)	<0.0001

Meta-Analysis Research Group in Echocardiography (MeRGE) AMI Collaborators. Independent Prognostic Importance of a Restrictive Left Ventricular Filling Pattern After Myocardial Infarction An Individual Patient Meta-Analysis: Meta-Analysis Research Group in Echocardiography Acute Myocardial Infarction. Circulation. 2008;117:2591-2598
Moeller JE et al. Prognostic Importance of Diastolic Function and Filling Pressure in Patients With Acute MI. Circulation 2006;114;438-444

Dg.: AIM bez AF
TTE: hospitalizace
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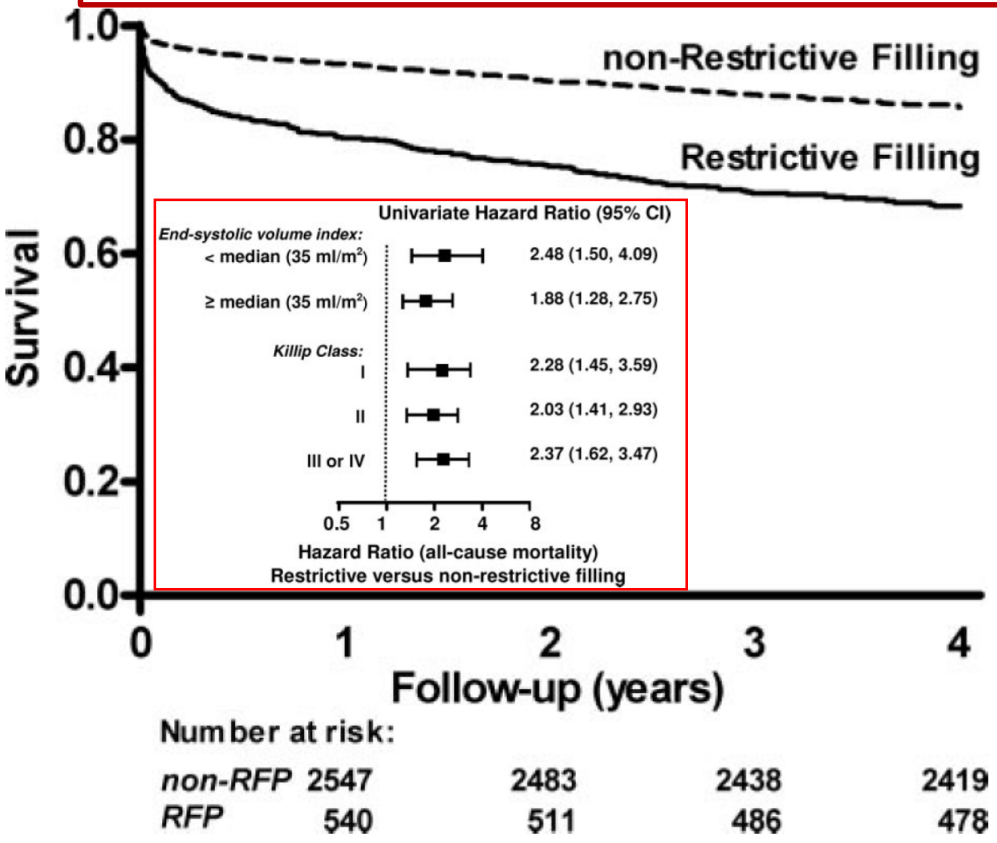
EP: mortalita
FU: ?

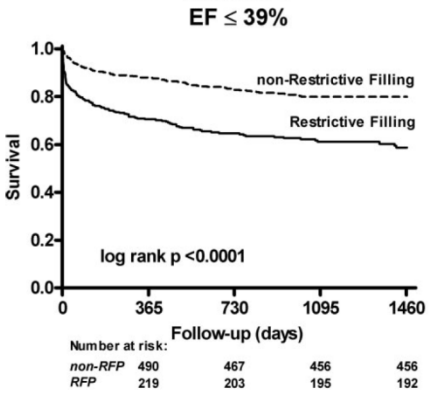
Independent Prognostic Importance of a Restrictive Left Ventricular Filling Pattern After Myocardial Infarction

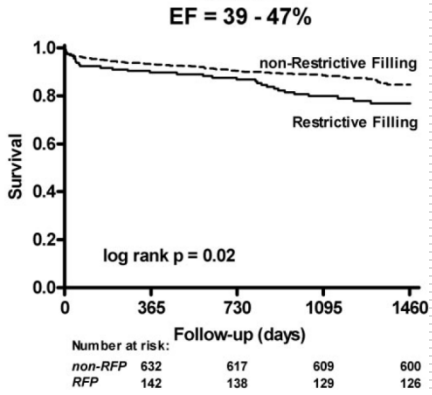
An Individual Patient Meta-Analysis: Meta-Analysis Research Group in Echocardiography Acute Myocardial Infarction

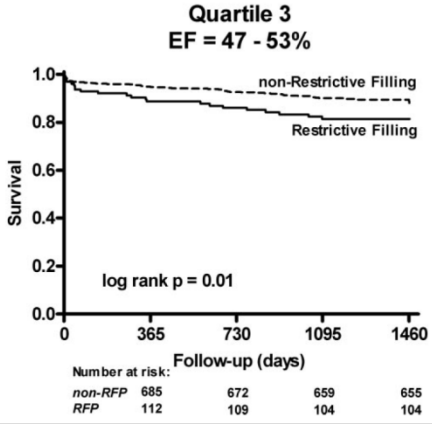
Meta-Analysis Research Group in Echocardiography (MeRGE) AMI Collaborators*

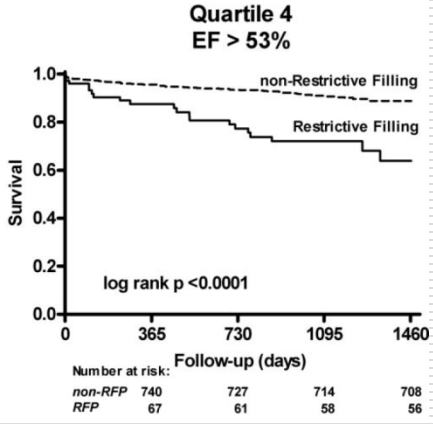
Restriktivní plnění LK u pacientů po AIM je nezávislý prognostický parametr bez ohledu na EF, volumy LK a klinické známky srdečního selhání.









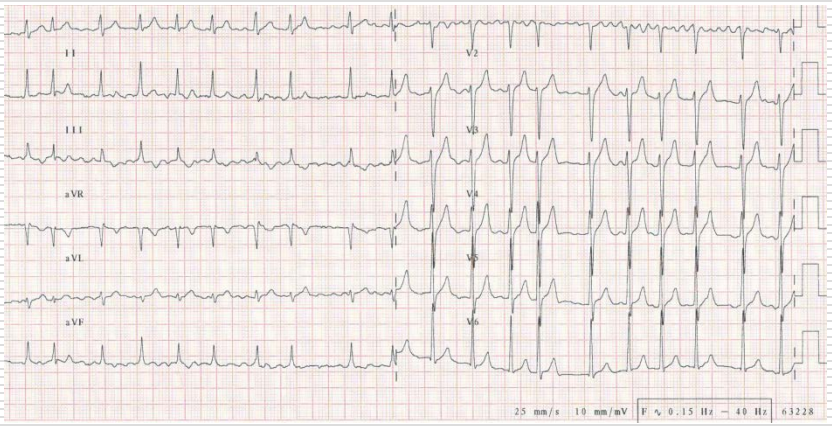


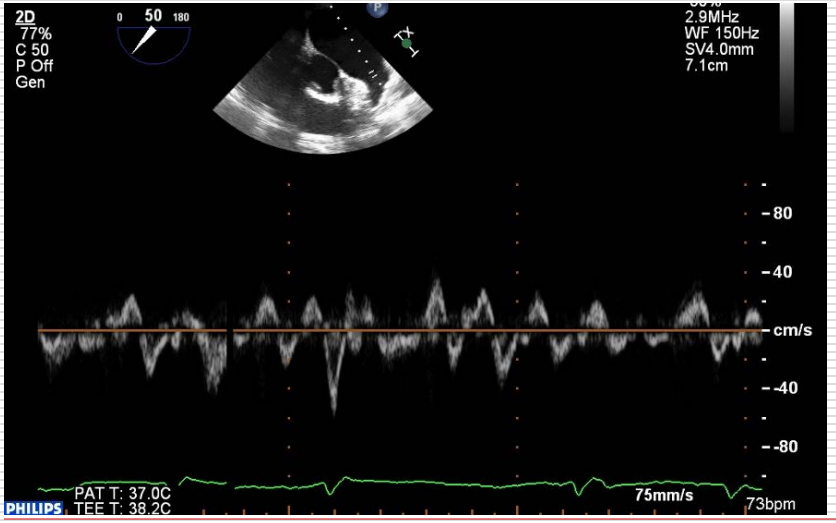
Dg.: IM
TTE: -
Parametry: FiS
EP: mortalita
FU: -

Atrial Fibrillation and Death After Myocardial Infarction

A Community Study

Patricia Jabre, MD, PhD; Xavier Jouven, MD, PhD; Frédéric Adnet, MD, PhD; Gabriel Thabut, MD, PhD; Suzette J. Bielinski, PhD; Susan A. Weston, MS; Véronique L. Roger, MD, MPH





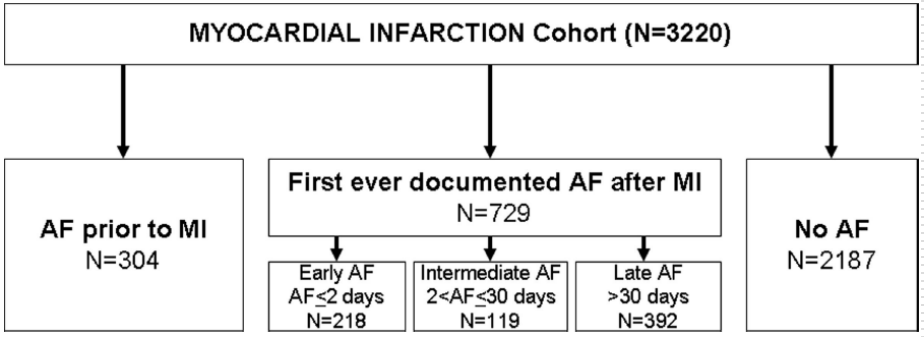


Table 2. Atrial Fibrillation and Risk of All-Cause Death and Cardiovascular Death After MI

	Prior AF	Early AF	Intermediate AF	Late AF	P*
Death					
Unadjusted	3.50 (3.03, 4.05)	3.02 (2.55, 3.58)	2.95 (2.36, 3.68)	5.25 (4.51, 6.10)	<0.001
Model 1†	1.68 (1.44, 1.95)	1.82 (1.54, 2.17)	2.20 (1.76, 2.75)	3.25 (2.79, 3.78)	<0.001
Model 2‡	1.46 (1.26, 1.70)	1.63 (1.37, 1.93)	1.81 (1.45, 2.27)	2.58 (2.21, 3.00)	<0.001
Death within 30 d post-MI					
Unadjusted	2.42 (1.78, 3.30)	3.72 (2.70, 5.12)	7.68 (4.91,12.01)	Not applicable	<0.001
Model 1†	1.21 (0.88, 1.66)	2.19 (1.58, 3.04)	5.86 (3.74, 9.17)	Not applicable	<0.001
Model 2‡	1.13 (0.82, 1.55)	2.02 (1.46, 2.80)	4.99 (3.18, 7.82)	Not applicable	<0.001
Death among 30 d survivors					
Unadjusted	3.99 (3.38, 4.73)	2.84 (2.32, 3.48)	2.52 (1.94, 3.28)	5.22 (4.46, 6.11)	<0.001
Model 1†	1.88 (1.58, 2.24)	1.73 (1.41, 2.13)	1.81 (1.39, 2.35)	3.21 (2.74,3.76)	<0.001
Model 2‡	1.59 (1.33, 1.89)	1.51 (1.23, 1.85)	1.47 (1.13, 1.92)	2.54 (2.17, 2.98)	<0.001
Cardiovascular death among 30 d survivors					
Unadjusted	3.88 (3.07, 4.91)	3.33 (2.55, 4.33)	3.41 (2.48, 4.70)	5.77 (4.66, 7.16)	<0.001
Model 1†	1.91 (1.49, 2.43)	2.04 (1.56, 2.67)	2.49 (1.81, 3.44)	3.62 (2.92, 4.49)	<0.001
Model 2‡	1.55 (1.22, 1.98)	1.72 (1.32, 2.25)	1.94 (1.40, 2.68)	2.70 (2.17, 3.36)	<0.001

Jabre P. et al. Atrial Fibrillation and Death After Myocardial Infarction. A Community Study. Circulation. 2011;123:2094-2100

Akutní koronární syndromy

Prognostický význam echokardiografie - **TDI**

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

Dg.: neselektovaná populace AIM
TTE: medián 1d od IM
Parametry: E/Em + ...
EP: mortalita, reIM, HF
FU: medián 2,9r

Noninvasive assessment of left ventricular filling pressure after acute myocardial infarction: A prospective study of the relative prognostic utility of clinical assessment, echocardiography, and B-type natriuretic peptide

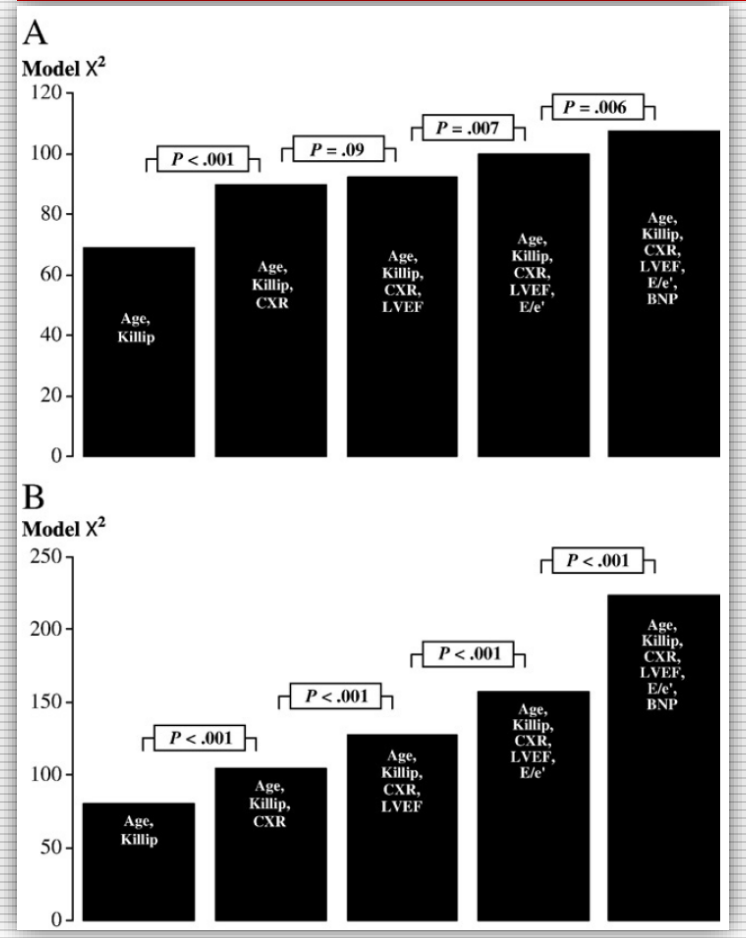
Kirsten Kruszewski, MBChB,[a] Anne E. Scott, MBChB,[a] Justin L. Barclay, MBChB,[a] Gary R. Small, MBBCh, PhD,[a] Bernard L. Croal, MBChB, MD,[b] Jacob E. Møller, MD, DMSc,[c] Jae K. Oh, MD,[d] and Graham S. Hillis, MBChB, PhD[a] *Aberdeen, United Kingdom; Copenhagen, Denmark; and Rochester, MN*

Characteristic	No AE (n = 340)*	Suffered AE (n = 57)*	OR (95% CI)	P value
Clinical and laboratory parameters				
Age, y	62 (54-71)	76 (70-83)	1.10 (1.07-1.14)	<.001
Risk factors and medical history				
Male	245 (72%)	40 (70%)	0.91 (0.49-1.69)	.77
Current smoker	145 (43%)	13 (23%)	0.40 (0.21-0.76)	.006
History of diabetes	30 (9%)	11 (19%)	2.47 (1.16-5.27)	.02
History of hypertension	116 (34%)	22 (39%)	1.21 (0.68-2.16)	.51
Prior CABG	15 (4%)	7 (12%)	3.03 (1.18-7.81)	.02
Previous MI	47 (14%)	23 (40%)	4.24 (2.28-7.86)	<.001
Body surface area	1.90 ± 0.22	1.87 ± 0.22	0.56 (0.16-2.02)	.38
Non–ST-segment elevation MI	128 (38%)	38 (67%)	3.31 (1.83-5.99)	<.001
Atrial fibrillation at time of echocardiogram	11 (3%)	3 (5%)	1.66 (0.45-6.15)	.45
Cardiac TnI level (ng/mL) at 12 h	27.5 (7.5-99.4)	22.4 (7.3-57.4)	1.00 (0.99-1.02)	.71
eGFR on admission (mL/min per 1.73m^2)	66 ± 16	56 ± 18	0.96 (0.94-0.98)	<.001
Received thrombolytic therapy	166 (49%)	17 (30%)	0.45 (0.24-0.82)	.009
Coronary angiogram during index admission	257 (76%)	30 (53%)	0.36 (0.20-0.64)	<.001
Multivessel coronary disease†	167 (65%)	27 (90%)	3.52 (1.19-10.37)	.02
In-hospital revascularization	185 (54%)	15 (26%)	0.30 (0.16-0.56)	<.001
Killip class on admission	1 (1-2)	2 (1-3)	3.63 (2.36-5.58)	<.001
Killip class ≥2 on admission	106 (31%)	38 (67%)	4.42 (2.43-8.02)	<.001
CXR evidence of heart failure	50 (15%)	33 (58%)	7.76 (4.23-14.21)	<.001
BNP level (pg/mL)	138 (68-245)	627 (195-1033)	1.19 (1.13-1.25)‡	<.001
Quartile of BNP§				
Quartile 1 (<71 pg/mL)	90 (27%)	7 (13%)	1.00	-
Quartile 2 (71-151 pg/mL)	93 (28%)	5 (9%)	0.69 (0.21-2.26)	.54
Quartile 3 (152-286 pg/mL)	88 (26%)	10 (19%)	1.46 (0.53-4.01)	.46
Quartile 4 (>286 pg/mL)	64 (19%)	32 (59%)	6.43 (2.67-15.47)	<.001
Echocardiographic parameters				
LV ejection fraction, %	48 ± 10	38 ± 13	0.93 (0.90-0.95)	<.001
LV ejection fraction <50%	185 (55%)	44 (80%)	3.31 (1.65-6.63)	.001
WMSI	1.40 (1.10-1.60)	1.70 (1.30-2.30)	4.94 (2.64-9.21)	<.001
Grade of mitral regurgitation	0.29 ± 0.56	0.72 ± 0.77	2.47 (1.67-3.64)‖	<.001
Moderate or greater mitral regurgitation	15 (4%)	9 (16%)	4.04 (1.67-9.74)	.0021
Mitral E-wave velocity, cm/s	67 ± 20	80 ± 25	1.28 (1.13-1.45)¶	<.001
Mitral A-wave velocity, cm/s	68 ± 21	77 ± 26	1.19 (1.05-1.34)¶	.006
E/*A* ratio	1.05 ± 0.43	1.18 ± 0.67	1.76 (0.99-3.13)	.05
DT, ms	227 ± 58	215 ± 65	0.96 (0.91-1.01)	.13
DT ≤150 ms	16 (5%)	9 (16%)	3.74 (1.56-8.93)#	.003
Grade of diastolic function				
Normal	39 (12%)	1 (2%)		
Grade I dysfunction	211 (63%)	32 (56%)		
Grade II dysfunction	64 (19%)	9 (16%)		
Grade III dysfunction	21 (6%)	15 (26%)	2.07 (1.47-2.93)**	<.001
Early mitral annulus velocity (e')				
Septal annulus, cm/s	5.8 ± 1.7	4.4 ± 1.6	0.58 (0.47-0.71)	<.001
Lateral annulus, cm/s	7.7 ± 2.6	6.5 ± 2.4	0.81 (0.72-0.92)	.002
Mean velocity, cm/s	6.8 ± 2.0	5.5 ± 1.9	0.69 (0.59-0.82)	<.001
E/*e'* septal	12.4 ± 5.2	21.0 ± 11.5	1.14 (1.09-1.18)	<.001
E/*e'* septal >15	62 (18%)	33 (58%)	6.14 (3.39-11.12)	<.001
E/*e'* lateral	9.6 ± 4.7	14.6 ± 9.6	1.13 (1.07-1.18)	<.001
E/*e'* mean	11.0 ± 4.5	17.8 ± 10.1	1.16 (1.11-1.22)	<.001
LA volume indexed for BSA, mL/m^2	30.1 ± 9.3	37.4 ± 13.4	1.06 (1.04-1.09)	<.001
LA volume index >32 mL/m^2	115 (34%)	35 (63%)	3.20 (1.78-5.76)	<.001

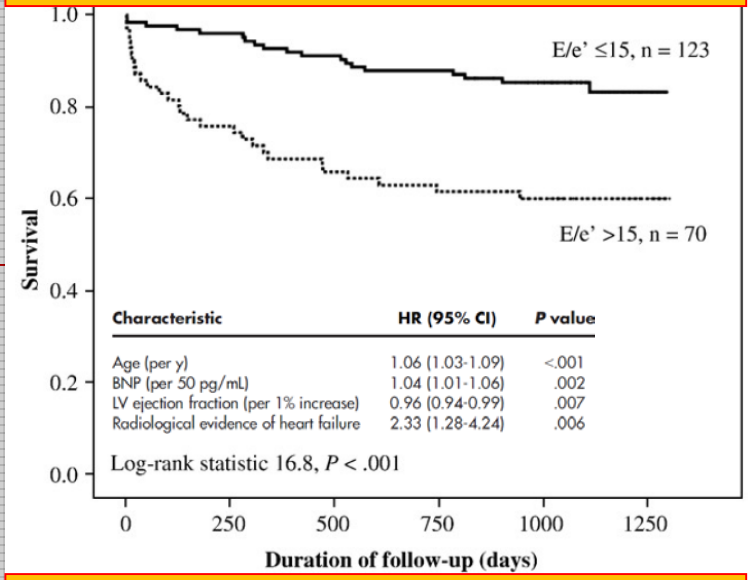
Characteristic	Alive (n = 338)	Died (n = 62)	HR (95% CI)	P valu
Clinical and laboratory parameters				
Age, y	62 (55-71)	76 (70-83)	1.10 (1.07-1.13)	<.001
Killip class on admission	1 (1-2)	2 (1-2)	2.95 (2.10-4.14)	<.001
Killip class ≥2 on admission	104 (31%)	42 (68%)	4.52 (2.60-7.87)	<.001
CXR evidence of heart failure	51 (15%)	33 (53%)	5.23 (3.13-8.73)	<.001
BNP level (pg/mL)	131 (67-235)	405 (193-991)	1.10 (1.08-1.12)‡	<.001
Quartile of BNP§				
Quartile 1 (<71 pg/mL)	95 (29%)	3 (5%)	1.00	-
Quartile 2 (71-151 pg/mL)	92 (28%)	6 (10%)	2.02 (0.51-8.09)	.32
Quartile 3 (152-286 pg/mL)	85 (26%)	13 (22%)	4.53 (1.29-15.90)	.02
Quartile 4 (>286 pg/mL)	61 (18%)	37 (63%)	14.26 (4.38-46.43)	<.001
Echocardiographic parameters				
LV ejection fraction, %	48 ± 10	38 ± 13	0.92 (0.90-0.95)	<.001
LV ejection fraction <50%	181 (54%)	50 (82%)	3.79 (1.92-7.50)	<.001
WMSI	1.30 (1.10-1.60)	1.70 (1.30-2.15)	4.00 (2.41-6.63)	<.001
Grade of mitral regurgitation	0.29 ± 0.57	0.68 ± 0.76	1.95 (1.45-2.64)‖	<.001
Moderate or greater mitral regurgitation	13 (4%)	11 (18%)	4.01 (2.03-7.93)	<.001
Mitral E-wave velocity, cm/s	67 ± 20	78 ± 27	1.20 (1.09-1.32)¶	<.001
Mitral A-wave velocity, cm/s	68 ± 21	75 ± 26	1.13 (1.02-1.26)¶	.02
E/*A* ratio	1.05 ± 0.40	1.20 ± 0.72	1.68 (0.99-2.85)	.05
DT ≤150 ms	17 (5%)	9 (15%)	3.15 (1.55-6.41)	.002
Grade of diastolic function				
Normal	39 (12%)	1 (2%)		
Grade I dysfunction	210 (63%)	34 (56%)		
Grade II dysfunction	63 (19%)	10 (16%)		
Grade III dysfunction	22 (7%)	16 (26%)	1.92 (1.42-2.60)**	<.001
Early mitral annulus velocity (e')				
Septal annulus, cm/s	5.81 ± 1.72	4.31 ± 1.70	0.57 (0.47-0.69)	<.001
Lateral annulus, cm/s	7.72 ± 2.51	6.49 ± 2.90	0.82 (0.73-0.93)	.001
Mean velocity, cm/s	6.76 ± 1.98	5.40 ± 2.19	0.70 (0.60-0.81)	<.001
E/*e'* septal	12.5 ± 5.3	20.9 ± 11.4	1.09 (1.07-1.12)	<.001
E/*e'* septal >15	63 (19%)	35 (56%)	4.67 (2.79-7.81)	<.001
E/*e'* lateral	9.5 ± 4.2	14.8 ± 10.1	1.09 (1.06-1.11)	<.001
E/*e'* mean	11.1 ± 4.7	17.6 ± 9.9	1.10 (1.07-1.12)	<.001
LA volume indexed for BSA, mL/m^2	30.2 ± 9.6	36.7 ± 12.3	1.05 (1.03-1.07)	<.001
LA volume index >32 mL/m^2	113 (34%)	40 (66%)	3.35 (1.95-5.75)	<.001

Kruszewski K. et al. Noninvasive assessment of left ventricular filling pressure after acute myocardial infarction: A prospective study of the relative prognostic utility of clinical assessment, echocardiography, and B-type natriuretic peptide. Am Heart J 2010;159:47-54.

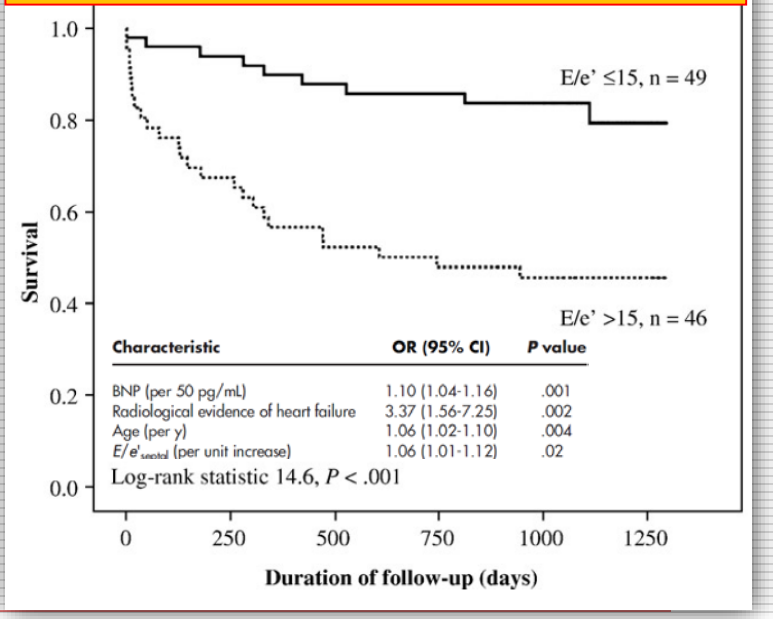
Dg.: neselektovaná populace AIM
TTE: medián 1d od IM
Parametry: E/Em + ...
EP: mortalita, reIM, HF
FU: medián 2,9r



Přežití u pacientů s NT-proBNP nad mediánem (151 pg/mL)



Přežití u pacientů s NT-proBNP ve 4. kvartilu (>286 pg/mL)



Kruszewski K. et al. Noninvasive assessment of left ventricular filling pressure after acute myocardial infarction: A prospective study of the relative prognostic utility of clinical assessment, echocardiography, and B-type natriuretic peptide. Am Heart J 2010;159:47-54.

Akutní koronární syndromy

Prognostický význam echokardiografie - **2D strain/SR a VVI**

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

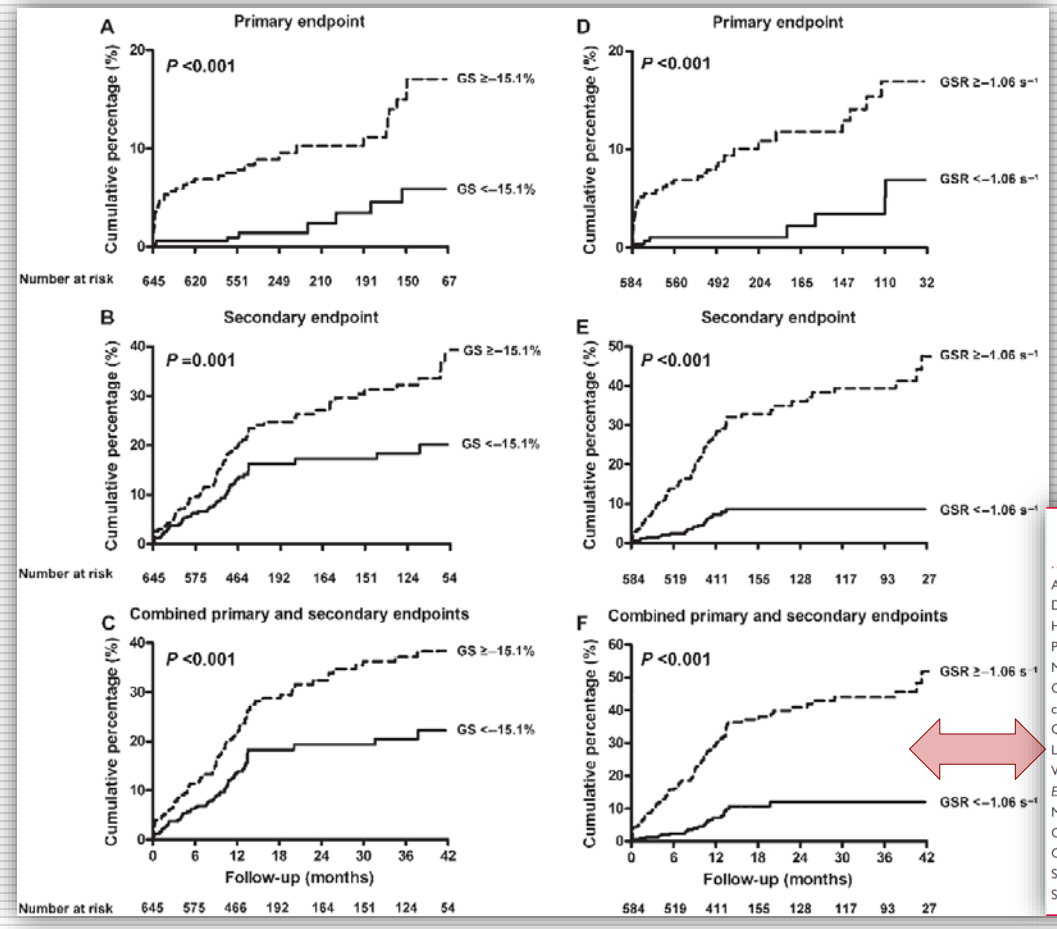
Dg.: AIM
TTE: do 48h od AIM/PCI
Parametry: GLS, GLSR
EP: pEP mortalita, sEP TVR, reIM, HF
FU: 21±13 m

European Heart Journal (2010) 31, 1640–1647
doi:10.1093/eurheartj/ehq105

CLINICAL RESEARCH
Imaging

Prognostic importance of strain and strain rate after acute myocardial infarction

M. Louisa Antoni[1], Sjoerd A. Mollema[1], Victoria Delgado[1], Jael Z. Atary[1], C. Jan Willem Borleffs[1], Eric Boersma[2], Eduard R. Holman[1], Ernst E. van der Wall[1], Martin J. Schalij[1], and Jeroen J. Bax[1]*



Globální longitudinální ST strain/SR přinášejí významnou prognostickou informaci v rizikové stratifikaci pacientů s akutním IM, která má silnější prediktivní hodnotu než standardně používané parametry funkce LK

	Univariate analysis			Multivariate analysis		
	HR	95% CI	*P*-value	HR	95% CI	*P*-value
Age (years)	1.0	1.0–1.0	<0.001			
Diabetes	1.7	1.1–2.5	0.01			
Hypertension	1.4	1.0–1.9	0.03			
Prior myocardial infarction	1.7	1.1–2.7	0.02			
Multivessel disease	2.4	1.8–3.3	<0.001	2.1	1.5–2.9	<0.001
CPK level (U/L)	1.0	1.0–1.0	0.03			
cTnT level (μg/L)	1.0	1.0–1.1	<0.001			
QRS duration (ms)	1.0	1.0–1.0	<0.001	1.0	1.0–1.0	<0.001
LVEF (%)	0.96	0.94–0.97	<0.001			
WMSI	2.1	1.2–3.6	0.007			
E/*E*′ ratio	1.0	1.0–1.1	0.04			
Moderate or severe MR	1.9	1.2–3.1	0.007			
Global strain (%)	1.1	1.1–1.1	<0.001	1.1	1.0–1.1	0.006
Global strain rate (s^{-1})	26	13–50	<0.001	18	10–35	<0.001
Strain of the infarct zone (%)	1.1	1.0–1.1	0.001			
Strain rate of the infarct zone (s^{-1})	22	11–46	<0.001	12	6–25	<0.001

Antoni ML. et al. Prognostic importance of strain and strain rate after acute myocardial infarction. European Heart Journal (2010) 31, 1640–1647

Dg.: 1. STEMI
TTE: před PCI a 3. den
Parametry: GLS STE
EP: mortalita a HF
FU: 6m

Prognostic Value of Serial Global Longitudinal Strain Measured by Two-Dimensional Speckle Tracking Echocardiography in Patients With ST-Segment Elevation Myocardial Infarction

Jong Shin Woo, MD, Woo-Shik Kim, MD, PhD*, Tae-Kyung Yu, MD, Sang Jin Ha, MD, Seok Yeon Kim, MD, Jong-Hoa Bae, MD, PhD, and Kwon Sam Kim, MD, PhD

Relativní změna GLS

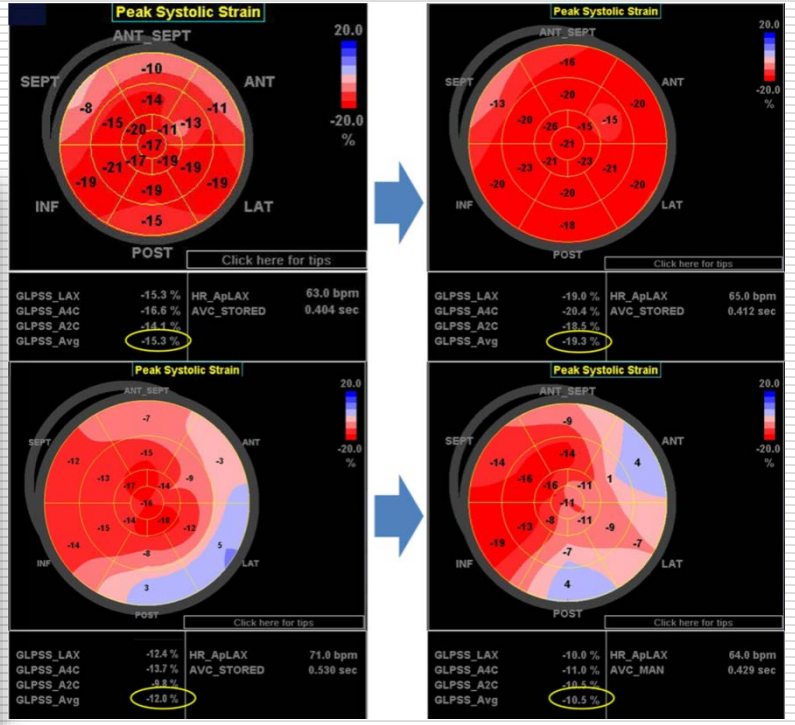
↑ GLS > 10%

GLS -10 -10%

↓ GLS < 10%

Demographic characteristics

Variables	Group (n = 29)	Group 2 (n = 55)	Group 3 (n = 14)	p Value
Age (years)	63.4 ± 11.9	65.3 ± 11.6	62.6 ± 13.1	0.47
Men	17 (59%)	38 (69%)	10 (71%)	0.33
Systolic blood pressure (mm Hg)	140.3 ± 27.8	129.3 ± 28.0	111.1 ± 25.6	<0.05
Diastolic blood pressure (mm Hg)	81.0 ± 14.2	76.9 ± 14.9	67.9 ± 13.6	<0.05
Heart rate (beats/min)	80.5 ± 14.7	79.6 ± 19.6	82.4 ± 23.7	0.65
Killip class >II	5 (17%)	14 (25%)	5 (36%)	0.18
Symptom-to-balloon time (minutes)	229.5 ± 76.2	231.2 ± 66.6	252.3 ± 164.6	0.56
Door-to-balloon time (minutes)	66.8 ± 14.8	68.4 ± 13.9	67.8 ± 15.2	0.77
Previous ischemic heart disease	2 (7%)	2 (4%)	1 (7%)	0.87
Hypertension	17 (59%)	34 (62%)	7 (50%)	0.72
Diabetes mellitus	8 (27%)	15 (27%)	3 (21%)	0.72
Dyslipidemia	8 (27%)	9 (16%)	2 (14%)	0.22
Smoking	18 (62%)	26 (47%)	6 (43%)	0.40
Culprit lesion—left anterior descending coronary artery	19 (65%)	24 (44%)	11 (78%)	<0.05
Multivessel coronary disease	15 (52%)	27 (49%)	12 (86%)	0.15
Type B2/C lesion	23 (79%)	36 (65%)	13 (93%)	0.72
Initial creatine kinase-MB (ng/ml)	32.5 ± 66.3	45.4 ± 83.4	53.4 ± 90.1	0.50
Peak creatine kinase-MB (ng/ml)	116.4 ± 114.7	122.5 ± 178.6	150.8 ± 118.6	0.23
Initial troponin I (ng/ml)	4.8 ± 14.5	8.7 ± 22.1	10.8 ± 26.3	0.47
Initial high-sensitivity C-reactive protein (mg/L)	2.9 ± 5.8	3.6 ± 3.7	3.5 ± 3.5	0.07
Initial N-terminal pro–B-type natriuretic peptide (pg/ml)	321.8 ± 282.6	609.1 ± 827.9	769.9 ± 727.8	0.07
Medications during admission				
Aspirin	29 (100%)	55 (100%)	14 (100%)	1
Clopidogrel	29 (100%)	55 (100%)	14 (100%)	1
Cilostazol	6 (21%)	11 (20%)	5 (36%)	0.37
β Blocker	19 (65%)	36 (65%)	7 (50%)	0.42
Angiotensin-converting enzyme inhibitor or angiotensin II receptor blocker	21 (72%)	45 (82%)	11 (78%)	0.49
Statins	25 (86%)	44 (80%)	11 (78%)	0.48



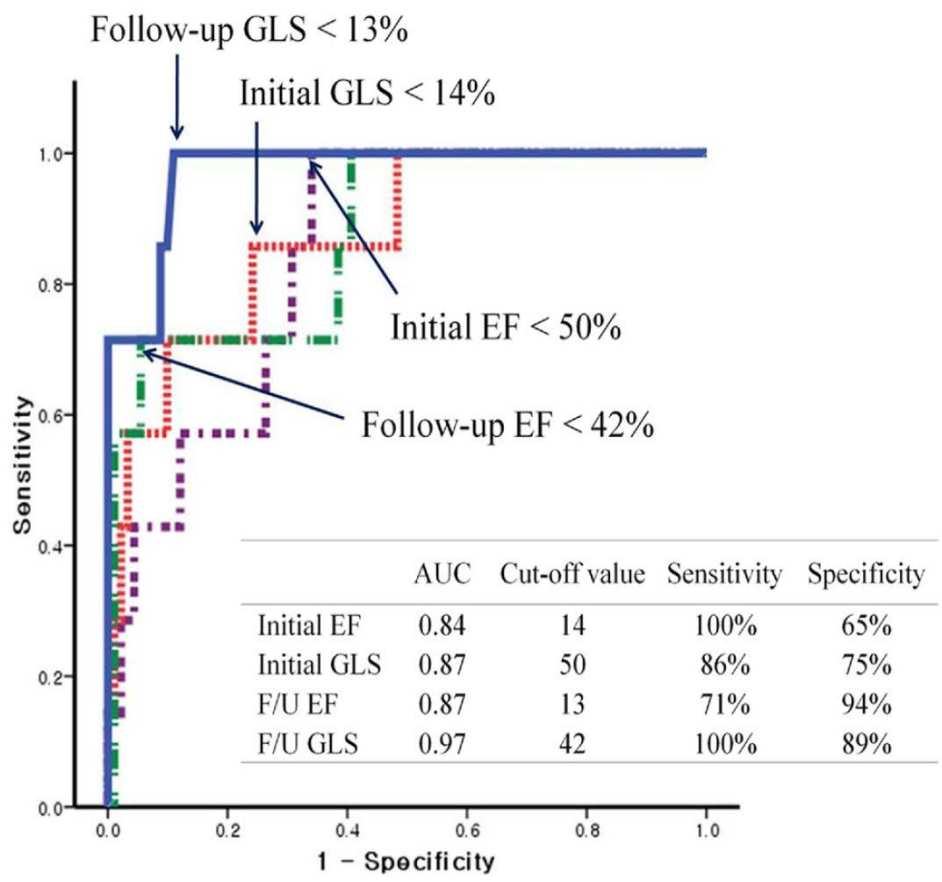
Před PCI

3. den

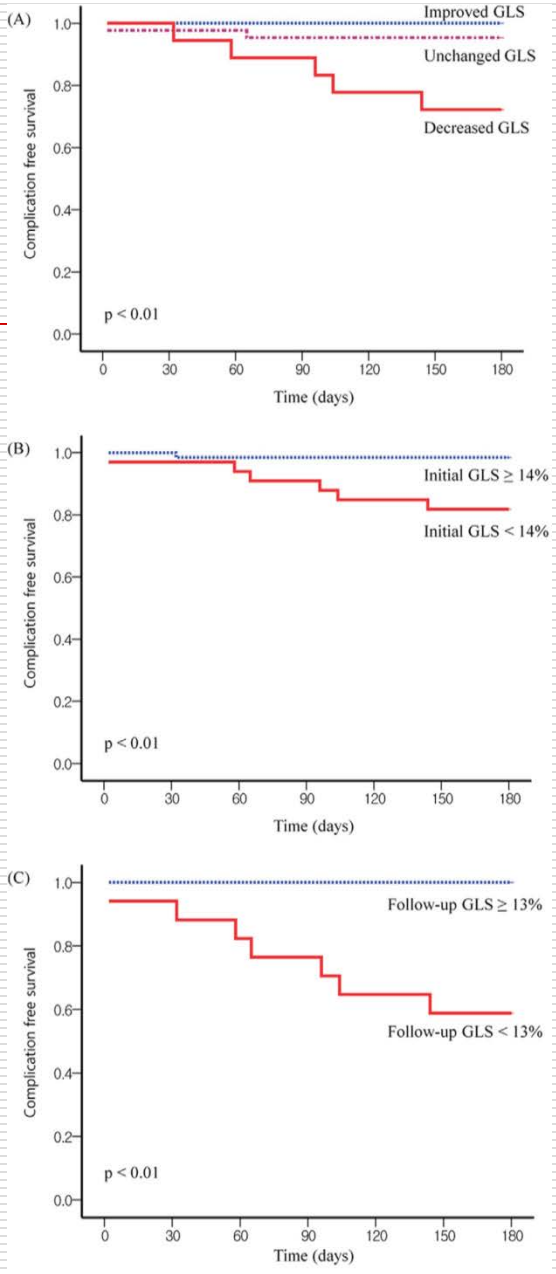
Woo JS et al. Prognostic Value of Serial Global Longitudinal Strain Measured by Two-Dimensional Speckle Tracking Echocardiography in Patients With ST-Segment Elevation Myocardial Infarction. Am J Cardiol 2011;xx:xxx – in press

I. INTERNÍ KLINIKA KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

Dg.: 1. STEMI
TTE: před PCI a 3. den
Parametry: GLS STE
EP: mortalita a HF
FU: 6m



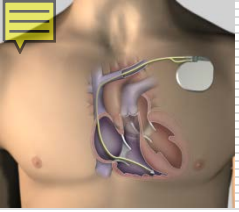
	AUC	Cut-off value	Sensitivity	Specificity
Initial EF	0.84	14	100%	65%
Initial GLS	0.87	50	86%	75%
F/U EF	0.87	13	71%	94%
F/U GLS	0.97	42	100%	89%



Woo JS et al. Prognostic Value of Serial Global Longitudinal Strain Measured by Two-Dimensional Speckle Tracking Echocardiography in Patients With ST-Segment Elevation Myocardial Infarction. Am J Cardiol 2011;xx:xxx – in press

Chronická ICHS

Prognostický význam echokardiografie **- indikace ICD/CRT-D**



TTE - indikace ICD/CRT-D

REVIEW ARTICLE

CURRENT CONCEPTS

Implantable Cardioverter–Defibrillators after Myocardial Infarction

Robert J. Myerburg, M.D.

Table 1. Summary of Major Randomized Trials of ICD Therapy for Primary Prevention of Sudden Death after Myocardial Infarction.*

Trial	Defined Entry Criteria	Time from Qualifying MI		Ejection Fraction of Enrolled Patients	All-Cause Mortality		Reduction in Mortality with ICD Therapy	
		Entry Criterion	Actual		Control Group	ICD Group	Relative	Absolute
				%	% of patients		% reduction	
MADIT (2-yr analysis)	EF ≤35%, previous MI, nonsustained VT, inducible VT not suppressed by intravenous administration of antiarrhythmic agents	≥3 wk	≥6 mo in 75% of cases	26±7	32	13	59	19
MUSTT (5-yr analysis)†	EF ≤40%, previous MI, nonsustained VT, inducible VT	Not defined	≥1 mo in 16% of cases; ≥3 yr in 49% of cases	Median, 30 (interquartile range, 21–35)	55	24	58	31
MADIT II (2-yr analysis)	EF ≤30%, previous MI	≥1 mo	≥6 mo in 88% of cases	23±5	22	16	28	6
SCD-HeFT (5-yr analysis)	EF ≤35%, NYHA class II or III congestive heart failure due to coronary heart disease or nonischemic cardiomyopathy	Not defined	Median, 4.3 yr	Median, 25 (interquartile range, 20–30)	36	29	23	7
DINAMIT (2.5-yr analysis)	EF ≤35%, recent MI, abnormal HRV	6–40 days	Mean, 18 days	28±5	17	19	—	—

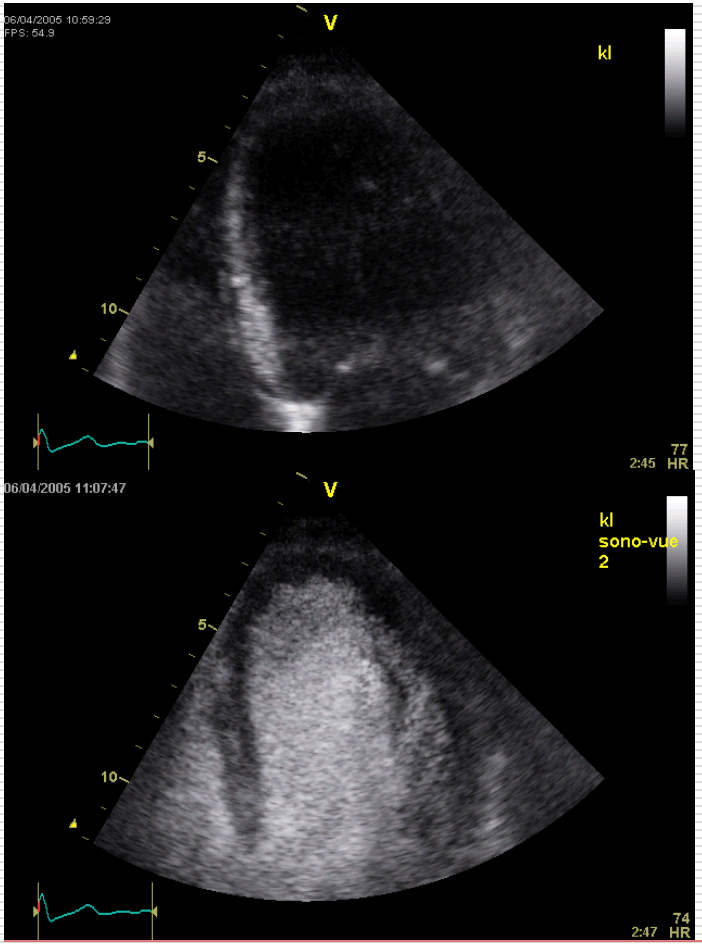
Meyburg MJ. Implantable Cardioverter–Defibrillators after Myocardial Infarction. N Engl J Med 2008;359:2245-53.

European Heart Journal (2015) 36, 2793–2867
doi:10.1093/eurheartj/ehv316

2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death

The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC)

Kdy implantace ICD po IM?



Timing of implantable cardioverter defibrillator placement after myocardial infarction. Assessment of left ventricular ejection fraction

Recommendations	Class[a]	Level[b]	Ref.[c]
Early (before discharge) assessment of LVEF is recommended in all patients with acute myocardial infarction.	I	C	286–288
Re-evaluation of LVEF 6–12 weeks after myocardial infarction is recommended to assess the potential need for primary prevention ICD implantation.	I	C	286–288

Chronické formy ICHS

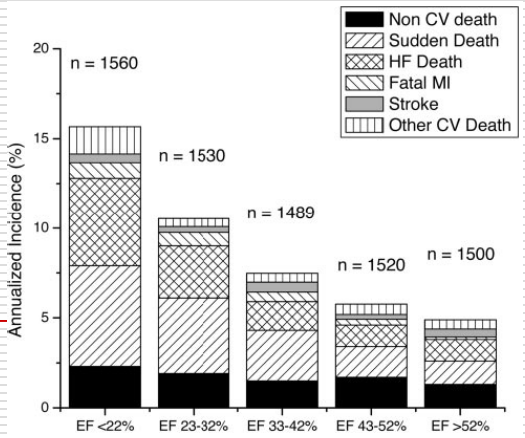
Prognostický význam echokardiografie - **systolická dysfunkce – viabilita myokardu**

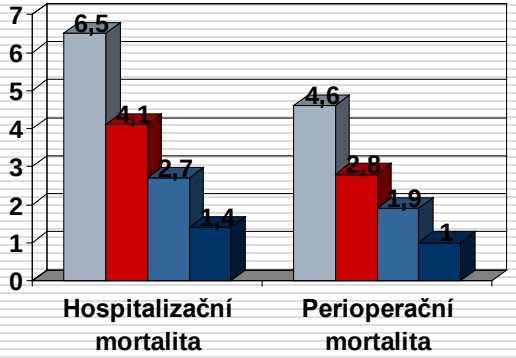
I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

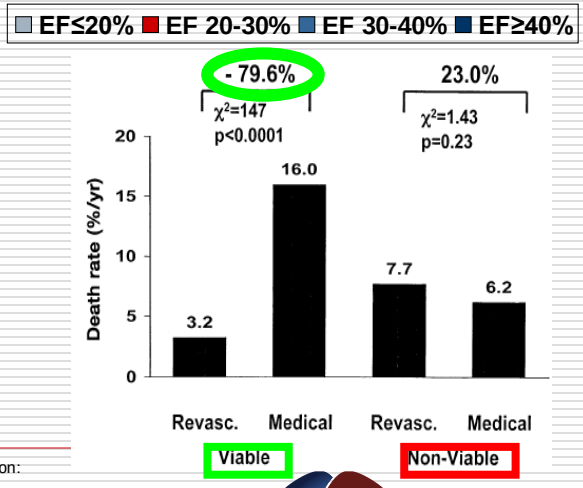
Význam viability myokardu

1. **PROGNOSTICKÝ VÝZNAM A EVIDENCE REVASKULARIZACE:**
   Metanalýza 24 nerandomizovaných studií, 3088 pacientů, průměrná EF LK 33%.....významný profit pacientů s předoperačním průkazem viability myokardu a systolickou dysfunkcí LK z revaskularizace a naopak negativní prognostický marker neprovedení revaskularizace viabilního myokardu

2. **COST/BENEFIT A PERIPROCEDURÁLNÍ RIZIKO**
   revaskularizačních operací (CABG)







Allman K.C. et al. Myocardial viability testing and impact of revascularization on prognosis in patients with coronary artery disease and left ventricular dysfunction: a meta-analysis. JACC 2002 39: 1151-58

Scott D. Solomon, et al. Influence of Ejection Fraction on Cardiovascular Outcomes in a Broad Spectrum of Heart Failure Patients Circulation 2005; 112; 3738-3744

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PII S0735-1097(02)01726-6

Coronary Revascularization

Myocardial Viability Testing and Impact of Revascularization on Prognosis in Patients With Coronary Artery Disease and Left Ventricular Dysfunction: A Meta-Analysis

Kevin C. Allman, MB, BS, FRACP, FACC,* Leslee J. Shaw, PHD,† Rory Hachamovitch, MD, FACC,† James E. Udelson, MD, FACC‡

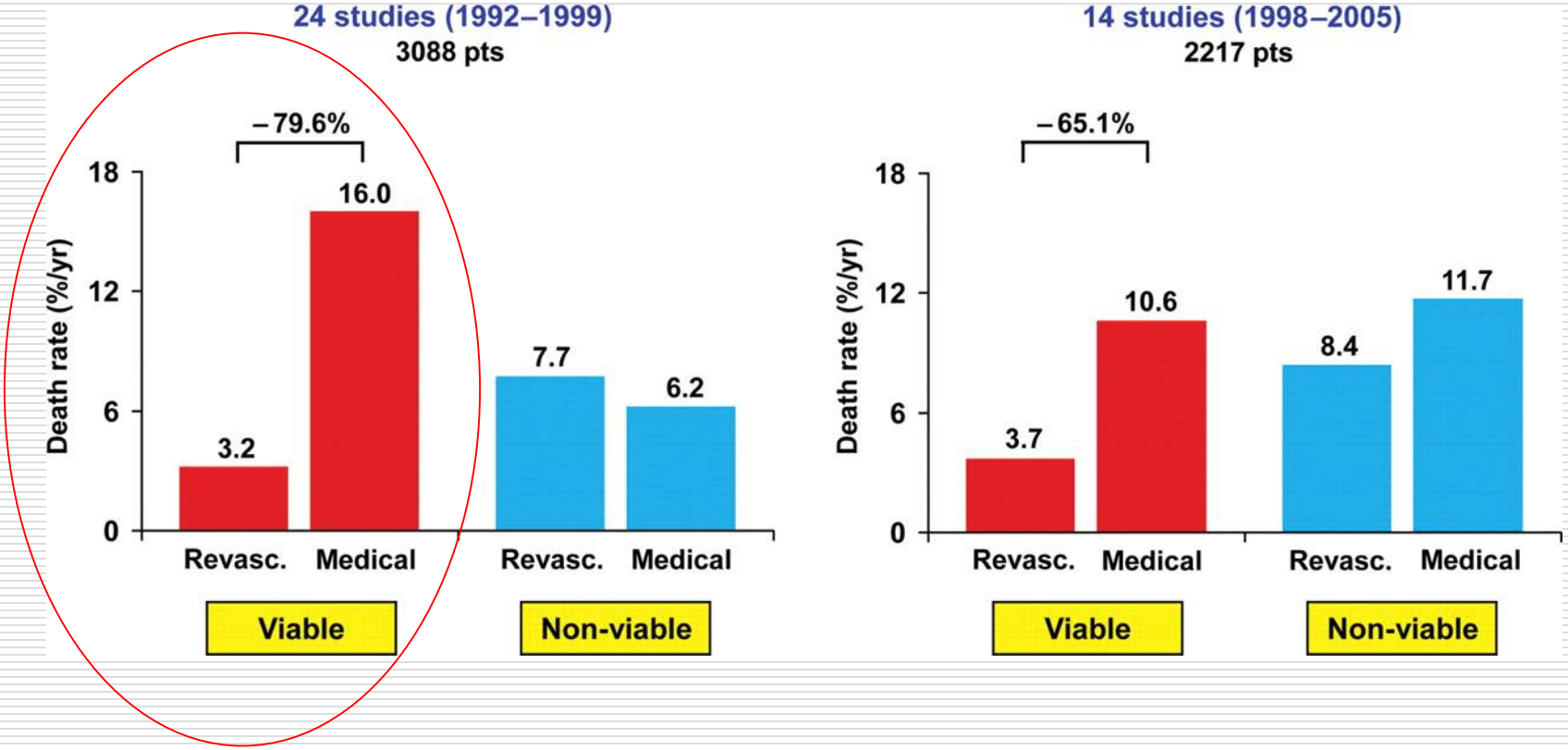
European Journal of Echocardiography
doi:10.1093/ehechocard/jer237

Is viability still viable after the STICH trial?

Lauro Cortigiani[1], Riccardo Bigi[2], and Rosa Sicari[3]*

[1]Cardiovascular Unit, Campo di Marte Hospital, Lucca, Italy; [2]Department of Cardiovascular Sciences, University School of Medicine, Milan, Italy; and [3]Institute of Clinical Physiology, CNR, Via G. Moruzzi 1, 56124 Pisa, Italy

Received 26 August 2011; accepted after revision 17 October 2011



Results of two meta-analysis on 3088 and 2217 patients with ischaemic cardiomyopathy, assessing the effect of revascularization and medical therapy according to the presence of viability at dobutamine echo or nuclear techniques

Allman KC. et al. Myocardial Viability Testing and Impact of Revascularization on Prognosis in Patients With Coronary Artery Disease and Left Ventricular Dysfunction: A Meta-Analysis. J Am Coll Cardiol 2002;39:1151-8
Cortigiani L, Bigi R, Sicari R. Is viability still viable after the STICH trial? Eur J Echocardiogr 2011;ejechocard.jer237

Dg.: ICHS, EF LK ≤ 35%
Parametry: viabilita myokardu (SPECT, DSE)
EP: mortalita
FU: 5,1r

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction

Robert O. Bonow, M.D., Gerald Maurer, M.D., Kerry L. Lee, Ph.D.,

Characteristic	All Patients (N=601)	Patients with Myocardial Viability (N=487)			Patients without Myocardial Viability (N=114)		
		Medical Therapy (N=243)	CABG (N=244)	P Value	Medical Therapy (N=60)	CABG (N=54)	P Value
Age — yr	60.7±9.4	60.0±9.7	61.5±9.2	0.05	61.6±8.5	60.0±9.2	0.34
Male sex — no. (%)	521 (87)	205 (84)	211 (86)	0.51	55 (92)	50 (93)	1.00
Previous myocardial infarction	481 (80)	190 (78)	183 (75)	0.41	56 (93)	52 (96)	0.68
Current Canadian Cardiac Society angina class — no. (%)				0.60			0.03
0	236 (39)	101 (42)	101 (41)		18 (30)	16 (30)	
I	94 (16)	34 (14)	34 (14)		19 (32)	7 (13)	
II	253 (42)	104 (43)	99 (41)		23 (38)	27 (50)	
III	14 (2)	3 (1)	8 (3)		0	3 (6)	
IV	4 (1)	1 (<1)	2 (1)		0	1 (2)	
Highest New York Heart Association functional class in 3 previous mo — no. (%)				0.51			0.25
I	27 (4)	15 (6)	9 (4)		0	3 (6)	
II	212 (35)	94 (39)	88 (36)		14 (23)	16 (30)	
III	275 (46)	100 (41)	111 (45)		36 (60)	28 (52)	
IV	87 (14)	34 (14)	36 (15)		10 (17)	7 (13)	
Risk-at-randomization score†	12.5±8.8	11.9±8.4	12.8±9.0	0.28	13.7±9.8	12.0±8.8	0.37
Medications at baseline — no. (%)							
Beta-blocker	534 (89)	221 (91)	216 (89)	0.38	52 (87)	45 (83)	0.62
ACE inhibitor	514 (86)	202 (83)	210 (86)	0.37	54 (90)	48 (89)	0.85
ARB	46 (8)	20 (8)	20 (8)	0.99	3 (5)	3 (6)	1.00
ACE inhibitor or ARB	554 (92)	219 (90)	227 (93)	0.25	57 (95)	51 (94)	1.00
Statin	508 (85)	212 (87)	193 (79)	0.02	56 (93)	47 (87)	0.26
Aspirin	513 (85)	209 (86)	205 (84)	0.54	56 (93)	43 (80)	0.03
Coronary artery disease distribution — no. (%)							
No. of diseased vessels with ≥75% stenosis				0.79			0.45
0	12 (2)	6 (2)	3 (1)		2 (3)	1 (2)	
1	152 (25)	62 (26)	62 (25)		17 (28)	11 (20)	
2	221 (37)	87 (36)	92 (38)		18 (30)	24 (44)	
3	215 (36)	88 (36)	86 (35)		23 (38)	18 (33)	
Left ventricular ejection fraction — %	26.7±8.6	28.1±8.4	27.0±8.2	0.30	22.6±8.5	23.3±9.1	0.50
Left ventricular end-diastolic volume index — ml/m² of body-surface area	122.8±41.9	117.8±37.9	116±35.1	0.63	152.3±51.3	140.0±53.8	0.16
Left ventricular end-systolic volume index — ml/m² of body-surface area	91.7±38.9	85.8±34.3	86.0±32.1	0.97	120.8±49.6	111.2±50.8	0.25

Bonow RO et al. Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction. N Engl J Med 2011;364:1617-25.

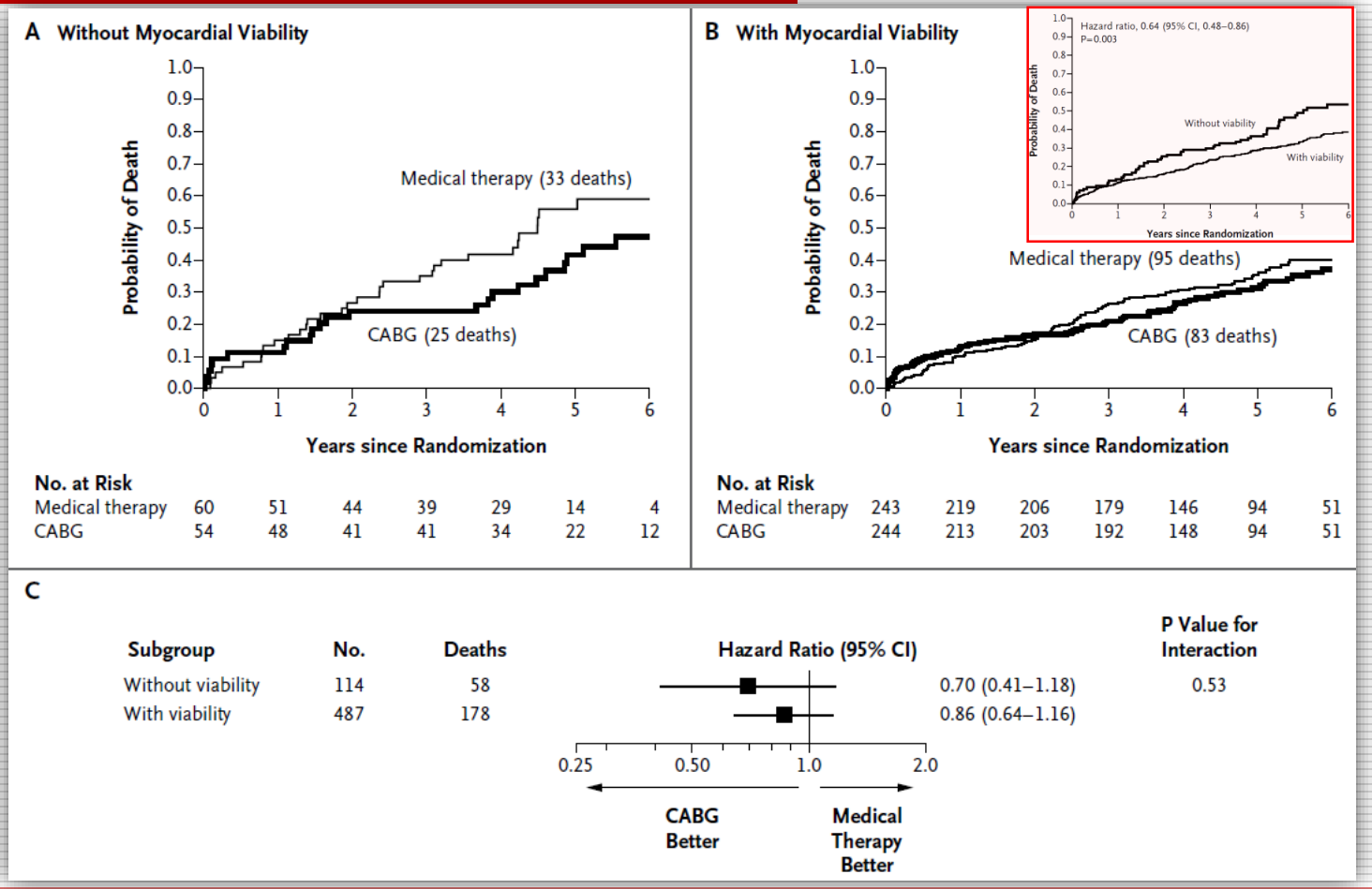
Dg.: ICHS, EF LK 32±8%
Parametry: viabilita myokardu (SPECT, DSE)
EP: mortalita
FU: 5,1r

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction

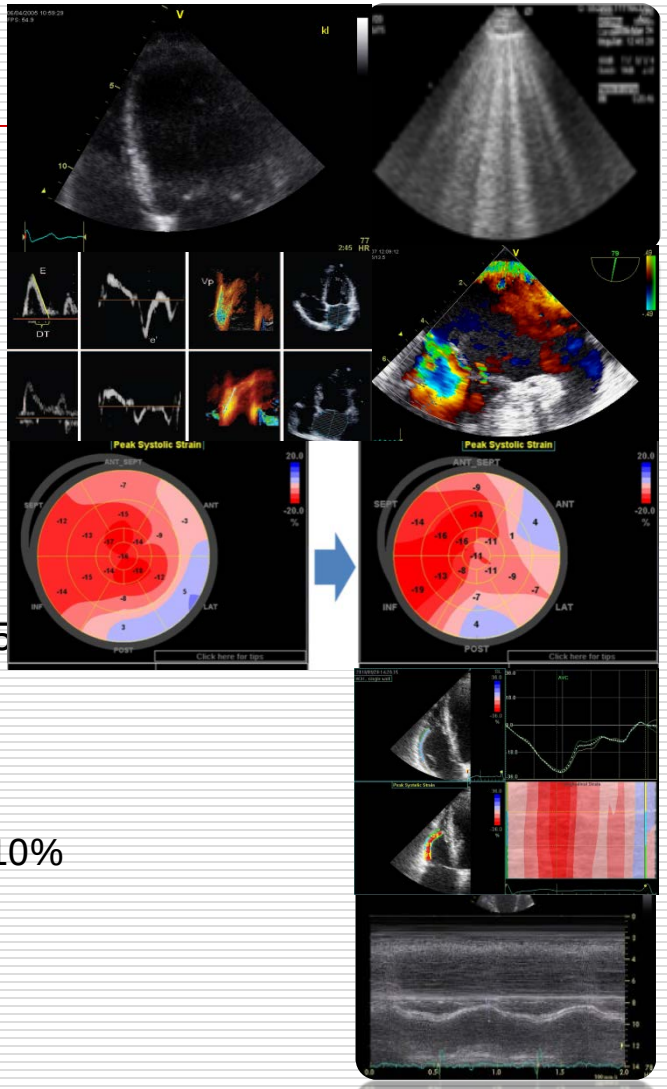
Robert O. Bonow, M.D., Gerald Maurer, M.D., Kerry L. Lee, Ph.D.,



Bonow RO et al. Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction. N Engl J Med 2011;364:1617-25.

Akutní koronární syndromy

Příznivá prognóza	Špatná prognóza
EF LK > 50%	Mechanická komplikace IM
ULC < 5	EF LK < 30%
Bez mitrální regurgitace	WMSI > 1,5
Normální typ plnění LK	ULC > 30
E/Em < 15	CSI > 1,68
Bez fibrilace síní	Mitrální regurgitace > III, IV
RVFAC > 32%	Restriktivní typ plnění LK, E/Em > 15
RV globální long. S < -22,1%	Fibrilace síní
TAPSE > 20 mm	Long. glob. S STE > -15,1
	Long. glob. SR STE > -1,06
	↓ long. glob. S STE 3. den hosp. > 10%
	RVFAC < 32%
	RV globální long. S > -22,1%
	TAPSE < 10 mm
	Mechanická asynchronie LK VVI



Chronická ICHS

Špatná prognóza

EF LK < 35% (50%)

Dynamická ischemická mitrální regurgitace

LAVI > 29 ml/m^2

LVMI > 90 g/m^2

VTI_{LVOT} < 22 mm

Diastolická dysfunkce (pseudonormalizované nebo restriktivní plnění LK)

Intraventrikulární asynchronie LK - STE

Diskordantní pozice LV elektrody CRT

Transmurální jizva stimulovaného segmentu CRT

Neviabilní myokard LK (< 5 segmentů s kontraktilní rezervou DSE)


Děkuji za pozornost